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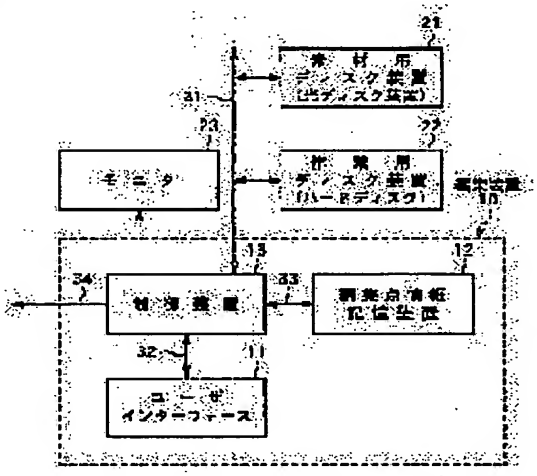
(54) EDITING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To perform nonlinear editing without deteriorating a transfer rate of a reproducing data even when a slow accessible storage device is used for housing material data and also the number of editing points is increased.
SOLUTION: At the time of deciding an editing point, a data adjacent to the editing point in the material data is copied from a material disk device 21 to a work disk device 22, and when the data adjacent to the editing point is to be reproduced, at the time of reproducing the edited data, first, the copied data in the work disk device 22 is read out to be the reproducing data, and also in the meantime, a data to be reproduced in the material disk device 21 is accessed, and after completion of this access, the read data from the theme disk device 21 becomes the reproducing data.



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CLAIMS

[Claim(s)]
[Claim 1] In the edit equipment for performing non-linear editing of image data or voice data using the storage in which random access is possible It connects with the 2nd storage for storing the data near [in the 1st storage in which the random access which stored material data is possible, and material data] the editing point. In case an editing point is determined, the data near [in material data] the editing point are reproduced from the 1st storag to the 2nd storage. at the time of reproduction of the data after edit In case the data near the editing point are reproduced, while reading the data first reproduced by the 2nd storage and considering as reproduction data While having read the data reproduced by the 2nd storage, access to the data which should be reproduced in the 1st storage is performed. Edit equipment characterized by having the control means which change reproduction data from the data read from the 2nd storage to the data read from the 1st storage after this access was completed.
[Claim 2] The aforementioned control means are edit equipment according to claim 1 characterized by packing an interval and recording the data near the editing point on the 2nd storage according to the turn that the data near the editing point are reproduced in case the data near [in material data] the editing point are reproduced from th 1st storage to the 2nd storage.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Th technical field to which invention belongs] this invention relates to the edit equipment for performing non-linear editing of image data or voice data using the storage in which random access is possible.
[0002]
[Description of the Prior Art] The edit method conventionally performed when editing image data is the method of r producing only the required portion of a material record medium and reproducing this one by one to another r cord medium. Generally, such an edit method is called linear editing. On the other hand, the edit method called non-linear editing using the storage in which random access, such as a hard disk drive unit, is possible is being circulated in recent years. In this non-linear editing, by a certain method, the position where the required image in a material record medium is recorded is determined, and this is memorized as editing point information, such as carrying out rapid-traverse reproduction of the material record medium in which random access is possible first. And at the time of reproduction, a desired image program can be acquired by performing random access to a material record medium according to editing point information.
[0003] In linear editing, in order to perform duplicate processing, the working hours which edit takes become longer than the reproduction time of the completed image program at least. On the other hand, in non-linear editing, it is rapid-traverse reproduction etc., and since what is necessary is just to determine even an editing point, the time which an editing task takes can be shortened. Thus, in non-linear editing, efficient work can be done in a short time taking advantage of the advantage of the storage in which random access is possible.
[0004]
[Problem(s) to be Solved by the Invention] By the way, generally in non-linear editing, the disk unit is used as storage in which random access is possible. However, such a disk unit is not the reason in which perfect random access is possible, and requires the time for seeking a head or performing rotational delay on the occasion of access. Especially, in an optical disk unit etc., generally the seek time and rotational delay are large, and these influences cannot be disregarded. For example, in non-linear editing, supposing it connects a different portion in a material record medium for every frame, when reproducing this, seek operation will occur for every frame. Thus, since one seeking must be performed whenever it reads to data of only one frame, the average transfer rate of read-out falls remarkably. If this average transfer rate is less than a required value, a reproduction image will b come way piece **********. Thus, in the edit equipment which performs non-linear editing, in order to reproduce reproduction data at the transfer rate more than fixed continuously, the number of the editing points in a c rtain section will be restricted, and it depends for this limiting value on the access time of the storage in which random access is possible.
[0005] Therefore, generally as storage in which the random access in non-linear editing is possible, the quick hard disk drive unit of access etc. is more desirable than the late optical disk unit of access etc. However, on the other hand, an optical disk unit has the advantage of being suitable for recording material data, when using the image recorded outdoors, for example as material data, since the record medium is generally removable. In addition, although the advantage of the both sides of an optical disk unit and a hard disk can be harnessed once it reproduces the material data recorded with the optical disk unit to a hard disk, considering the time of a duplicate, the merit of non-linear editing that it can edit will be lost for a short time.
[0006] this invention was made in view of this trouble, and even if the number of the purpose of editing points increases in material data storage, using the late storage of access, it is to offer the edit equipment which enabled it to perform non-linear editing, without reducing a reproduction data transfer rate.
[0007]
[Means for Solving the Problem] In the edit equipment for the edit equipment of this invention performing non-linear editing of image data or voice data using the storage in which random access is possible It connects with the 2nd storag f r storing the data n ar [in the 1st storag in which the random access which stor d mat rial data is possibl , and material data] th diting point. In cas an editing point is d t rmin d, th data near [in material data] th editing point ar reproduced from the 1st storag t th 2nd storag . at th time of r production of the data after dit In case the data n ar th diting point ar r produced, whil reading th data first r produc d by the 2nd storag and consid ring as r pr duction data Whil having read the data reproduc d by th 2nd storag , access t the data which should b reproduced in th 1st storag is p rformed. Aft r this access is compl t d, it has th c ntrol m ans which change r production data from th data r ad from th 2nd storag to th data r ad fr m th

1st storage.
[0008] With this edit equipment, in cas an diting point is determined, the data near [in material data] th editing point are reproduced by the 2nd storage from th 1st storage by control means. And at the time of reproduction of th data after dit, by control m ans, in case the data near th editing point ar reproduced Th data reproduced by th 2nd storage of introduction ar read, and it considers as reproduction data. Whil th data reproduced by the 2nd storage are read, access to the data which should be reproduc d in the 1st storag is performed. After this access is compl ted, reproduction data ar changed from the data read from th 2nd storage to the data r ad from th 1st storage.
[0009]
[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained in detail with reference to a drawing.
[0010] Drawing 1 is the block diagram showing the structure of a system containing the edit equipment concerning th gestalt of operation of the 1st of this invention. The disk unit 21 for materials as the 1st storage in which the random access which this system was connected to the edit equipment 10 concerning the gestalt of this operation and this edit equipment 10, and stored material data is possible, It connected with edit equipment 10, and it connected with the disk unit 22 for work and the edit equipment 10 as the 2nd storage for storing the data near [in material data] the editing point, and has the monitor 23 for displaying a picture. It connected with the disk unit 21 for materials, the disk unit 22 for work, and the monitor 23, and edit equipment 10 is equipped with the control unit 13 as control means which control these while it connects with the editing point information storage device 12, and th user interface 11 and the editing point information storage device 12 for memorizing the information on the editing point in the user interface 11 and material data for performing operation of determining the editing point in material data and it controls these. Control information and data 31 are sent and received between a control unit 13, and the disk unit 21 for materials and the disk unit 22 for work, control information 32 is sent and received between a control unit 13 and a user interface 11, and the editing point information 33 is sent and received between a control unit 13 and the editing point information storage device 12. Moreover, a control unit 13 outputs the reproduction data 34 after edit.
[0011] The user interface 11 contains various kinds of switches, levers, etc. The editing point information recording device 12 is equipment for memorizing time codes, such as a start point of each cut, and an ending point, and consists of a hard disk, semiconductor memory, etc. The control unit 13 has CPU (central processing unit), ROM (read only memory) which stored the program which this CPU performs, and RAM (random access memory) used as a working area.
[0012] Both the disk unit 21 for materials and the disk unit 22 for work shall have the capacity to perform record and reproduction of image data or voice data, and the recorded data shall be managed by the time code. An optical disk unit is used as a disk unit 21 for materials, and a hard disk is used as a disk unit 22 for work.
[0013] The outline of operation of the edit equipment 10 applied to the gestalt of this operation here is explained. Here, it thinks taking the case of the case where use an optical disk unit as a disk unit 21 for materials, and a hard disk is used as a disk unit 22 for work. Since the lateness of access of the optical disk unit as a disk unit 21 for mat rials is covered, when reproducing material data to a hard disk beforehand, it is not necessary to reproduce all th material data to a hard disk. Namely, what is necessary is to reproduce only the data of the period which is equivalent to Taccs from a head, respectively in each cut to connect, if maximum of the time which seeking and rotational delay in an optical disk unit take is set to Taccs. If it sets, in this way, in the case of reproduction of the data after edit The data read from the hard disk are used as reproduction data between Taccs(es) of the head of each cut. in the meantime After it performs access to the data which should be reproduced in an optical disk unit and the period of Taccs passes The lateness of access of an optical disk unit is suppliable with changing so that th data which replaced with the data read from a hard disk, and were read from the optical disk unit may be used as reproduction data.
[0014] In order to realize above-mentioned processing, the procedure of reproducing the data of the period of Taccs from the head of each cut from an optical disk unit to a hard disk is required. by the way, a common optical disk unit — setting — Taccs — at most — it is number dozens to 100 m seconds On the other hand, an editing-task company determines an editing point, looking at the picture near the editing point by rapid-traverse reproduction etc., after giving near aim, in case an editing point is determined. Since it is the work whose human b ing does such work, although one editing point is determined, even if short, it takes several seconds. Therefore, though the data of the period of Taccs are reproduced from the head of a cut from an optical disk unit to a hard disk when an editing point is determined, it can carry out abbreviation disregard in time for an editing-task company.

[0015] In case an editing-task company determines an editing point with the edit equipment 10 concerning the gestalt of this operation by the above idea using a user interface 11, a control unit 13 reproduces the data of the p riod of Taccs from the head of each cut fr m th disk unit 21 for materials (optical disk unit) to the disk unit 22 for work (hard disk) whil making the editing point informati n storage d vice 12 memorize th information n an editing point. At th tim f r producti n of th data aft r edit, moreov r, a control unit 13 In case the data near th editing point ar reproduc d, whil r ading th data first r produc d by th disk unit 22 for work and c nsid ring as th r production data 34 Aft r p rforming acc ss to the data which should b repr duced in the disk unit 21 for materials in th meantime and c mpleting this acc ss, c ntrol which us s as the reproduction data 34 the data which replac d with the data read fr m th disk unit 22 f r work, and w r read from th disk unit 21 for mat rials is

p rformed.
[0016] N xt, operation of th edit equipment 10 concerning the form of this operation is explained concretely. H re, the maximum Taccs of the acc ss time of this optical disk unit is assumed to be 1 s cond using th optical disk unit as a disk unit 21 for mat rials. An optical disk unit is loaded with th optical disk with which material data wer record d. Drawing 3 (a) is a timing chart which shows th position of the cut in th data recorded on the optical disk as a r cord m dium in th disk unit 21 f r mat rials. Hereaft r, as shown in drawing 3 (a), th case wher edit which extracts cut (1) 41 and cut (2) 42, and conn cts from the data record d on th optical disk is performed is considered. In addition, in drawing 3 (a), A1 and C1 express the start point of cut (1) 41, and an ending point, respectively, and A2 and C2 express the start point of cut (2) 42, and the ending point, respectively. Tcut1 expresses the time of cut (1) 41, and Tcut2 expresses the time of cut (2) 42. Moreover, B1 expresses the point after Taccs progress from A1, and B-2 expresses the point after Taccs progress from A2.
[0017] When extracting and connecting cut (1) 41 and cut (2) 42 as mentioned above, with the gestalt of this operation, the data of the portion (it is hereafter described as a head portion.) of the period of Taccs are r produced from the head of each cut from the disk unit 21 for materials to the disk unit 22 for work. Drawing 3 (b) is a timing chart which shows the data recorded on the disk unit 22 for work. In this drawing 3 (b), a sign 51 expresses the head portion of a cut (1), and the sign 52 expresses the head portion of a cut (2). In the disk unit 22 for work, these head portions 51 and 52 pack an interval, and are recorded. Moreover, in drawing 3 (b), D1 expresses th point of a start of the head portion 51 of a cut (1), D2 expresses the point (it is the same as the point of an end of the head portion 51 of a cut (1).) of a start of the head portion 52 of a cut (2), and D3 expresses the point of an end of the head portion 52 of a cut (2).
[0018] Moreover, below, the time code of each point shown in drawing 3 (a) and (b) explains taking the case of the cas where it is the value shown in drawing 4 . In addition, with the notation of the time code shown in drawing 4 , two digits divided by m, s, and f shall express a part, a second, and a frame, and may be 1 second at 30 frames, respectively.
[0019] Drawing 2 is the flow chart showing operation at the time of edit of the edit equipment 10 concerning the gestalt of this operation. At the time of this edit, a control unit 13 sets initial value of the cut number n to 1 as initial setting first. Moreover, although the copy place time code variable D used in order to show the points D1 and D2 in the disk unit 22 for work and — needs to point out the head of the suitable free area on the record medium in th disk unit 22 for work as initial value, it shall point out D1 point in drawing 3 (b), and sets it to D= 00m00s00 f her (Step S101). Next, a control unit 13 judges whether it is an edit end (Step S102), and, in an edit end, (Y) ends operation at the time of edit. In addition, directions of being an edit end are performed when an editing-task company operates a user interface 11.
[0020] When it is not an edit end (step S102;N) An editing-task company is operating a user interface 11, and minds a control unit 13. Publishing commands (control information), such as reproduction, a rapid traverse, and coma d livery, to the disk unit 21 for materials, displaying the picture of material data on a monitor 23, and looking at this picture Cut (1) The point of A1 in the head position (a), i.e., drawing 3 , of 41 is looked for, and a picture is stopped in th position. And an editing-task company operates start point determination by pushing the predetermined switch in a user interface 11 etc. Thereby, the input of the start point time code variable A is performed, and it is set up with A=A1 (Step S103). In response, as for a control unit 13, the time code in the disk unit 22 for work reproduces the data from A1 point [in / the section (a), i.e. drawing 3 , from A to A+Taccs / in the time code in the disk unit 21 for materials] to B1 point from the point of D, i.e., D1 point in drawing 3 (b), to a field (Step S104). If th picture is displayed on a monitor 23 with the duplicate of data at this time, an editing-task company can check an editing point. Next, a control unit 13 saves the start point time code variable A and the copy place time code variable D to the field of A (n) in the editing point information storage device 12, and D (n), respectively (Step S105).

[0021] Next, an editing-task company is operating a user interface 11, looks for the ending point of cut (1) 41, i.e., C1 point, and operates ending point determination by pushing a switch etc. Thereby, the input of the ending point time code variable C is performed, and it is set up with C=C1 (Step S106). A control unit 13 saves this ending point time code variable C to the field of C (n) in the editing point information storage device 12 (Step S107). At this tim , as shown in drawing 5 , editing point information (A (1), C (1), D (1)) will be recorded on the editing point information st rage device 12. Next, a control unit 13 increments the cut number n one time (Step S108), equips the next edit with it, and as D=D+Taccs, as (Step S109) and D point out the free area of the degree in the disk unit 22 for work, i. ., D2 point, it returns to Step S102.
[0022] And an editing-task company looks for and determines a start point A2 and the ending point C2 similarly about cut 2 by performing Step S103 or Step S109 again. Thereby, the start point time code variable A and the ending point time code variable C are set up with A=A2 and C=C2, respectively. As for a control unit 13, the time c de in the disk unit 22 for work reproduces the data from A2 point [in / the section (a) i.e., drawing 3 , from A to A+Taccs / in th time c d in th disk unit 21 for mat rials] to B-2 point from the p int of D, i. ., D2 p int in drawing 3 (b), to a field. A contr l unit 13 sav s each time code variables A, D, and C again to th fi ld f A (n) in the diting point information storag devic 12, D (n), and C (n), r sp ctively. At this tim , as shown in drawing 6 , diting point informati n will b r corded on th diting point information storage device 12.
[0023] An diting-task company does in this way, and determin s an diting p int on aft r another, and the information is r corded on the diting point information storag d vice 12.
[0024] Drawing 7 is the flow chart showing peration at th tim f th repr duction aft r dit of the dit quipm nt

10 concerning the gestalt of this operation. At th time of this reproduction, a control unit 13 sets initial value of the cut number n to 1 as initial s tting first (Step S201). Next, a control unit 13 judges wh th r A (n) exists with refer nc to th editing point information storag d vice 12 (Step S202). When A (n) does not exist, (N) ends op ration at the time of reproduction. When A (n) exists, a control unit 13 reads A (n), C (n), and D (n) from the editing point information storag device 12, and (Y) s ts up the time cod variables A, S, C, and D with A=A(n) S=A (n)+Taccs, C=C (n), and D=D (n), respectiv ly. In addition, sinc it is n= 1, they are A=A(1) S=A(1)+Taccs, C=C (1), and D=D (1) her . N xt, as for a control unit 13, according to these tim code variables, a tim cod [in / the disk unit 22 for work / for the data of the head portion of a cut (1)] starts read-out from the point of D, i.e., D1 point in drawing 3 (b), (Step S204). With it, to the disk unit 21 for materials, a control unit 13 publishes an instruction so that a time code may seek at the point of S (Step S205). Here, S points have pointed out the point after Taccs, i.e., B1 point in drawing 3 (a), from A1 point. And after waiting (Step S206) and Taccs pass, only the time of Taccs ends read-out from the disk unit 22 for work (Step S207), and is changed from the disk unit 21 for materials which should already have completed seeking to read-out (Step S208). Then, a control unit 13 increments waiting (Step S209) and Variable n one time (Step S210), returns to Step S202, and moves from the time of C-S passing to regeneration of the next cut.

[0025] A control unit 13 sets up the time code variables A, S, C, and D with A=A(2) S=A(2)+Taccs, C=C (2), and D=D (2) with reference to the editing point information storage device 12, respectively. And a control unit 13 starts read-out according to these time code variables from D2 point [in / the point of D, i.e., drawing 3 , (b) / in a time code / in / the disk unit 22 for work / for the data of the head portion of a cut (2)]]. With it, to the disk unit 21 for materials, a control unit 13 publishes an instruction so that a time code may seek at the point of S. Here, S points have pointed out the point after Taccs, i.e., B-2 point in drawing 3 (a), from A2 point. And after Taccs passes, read-out from the disk unit 22 for work is ended, and it changes from the disk unit 21 for materials which should already have completed seeking to read-out.

[0026] Thus, at the time of reproduction, data without a way piece are reproducible with reference to the data of the editing point information storage device 12 by reading data from the disk unit 22 for work, and the disk unit 21 for materials by turns.

[0027] As explained above, in case an editing point is determined according to the edit equipment 10 concerning the gestalt of this operation The data near [in material data] the editing point are reproduced from the disk unit 21 for materials to the disk unit 22 for work. at the time of reproduction of the data after edit In case the data near the editing point are reproduced, while reading the data first reproduced by the disk unit 22 for work and considering as reproduction data Access to the data which should be reproduced in the disk unit 21 for materials in the meantim is performed. Since it was made to use the data which replaced with the data read from the disk unit 22 for work, and were read from the disk unit 21 for materials as reproduction data after this access was completed Even if th number of editing points increases in the disk unit 21 for materials, using the late storage of access, non-linear editing can be performed without reducing a reproduction data transfer rate. Therefore, as a disk unit 21 for materials, even if access is slow, storage with the merit that a record medium is removable or that it is cheap can be used. For example, it is realizable to carry out non-linear editing of the material data recorded with the camera on apparatus videocassette recorder using the optical disk and the magnetic tape as a record medium, and to s nd them out as it is.

[0028] Next, the edit equipment concerning the form of operation of the 2nd of this invention is explained. Depending on the cut to edit, the time may be shorter than Taccs. Drawing 8 (a) is a timing chart which shows th position of the cut in the data recorded on the disk unit 21 for materials, when it includes such a cut. In addition, in drawing 8 (a), A3 and C3 express the start point of cut (3) 43, and an ending point, respectively, and A4 and C4 express the start point of cut (4) 44, and the ending point, respectively. Tcut3 expresses the time of cut (3) 43, and Tcut4 expresses the time of cut (4) 44. Moreover, B3 expresses the point after Taccs progress from A3, and B4 expresses the point after Taccs progress from A4. Moreover, only Tcopied which mentions E4 later from B4 expresses the front point. In the example shown in drawing 8 (a), the time Tcut3 of cut (3) 43 is shorter than Taccs.

[0029] The edit equipment concerning the gestalt of this operation is the example which enabled it to cope with it wh n above. The fundamental composition of the edit equipment concerning the gestalt of this operation is as having been shown in drawing 1 like the gestalt of the 1st operation.

[0030] Drawing 9 is the flow chart showing operation at the time of edit of the edit equipment concerning the gestalt of this operation. In this operation, first, as initial setting, a control unit 13 sets initial value of the cut number n to 1, and sets the copy place time code variable D to 00m00s00 f. Furthermore, a control unit 13 is the flag Small which shows whether the time of a cut is shorter than a predetermined reference value. Cut is set to 0 and the variable Tcopied which shows the sum total time of the cut reproduced as a cut shorter than Taccs within Time Taccs is set to 00m00s00 f (Step S301). Next, a control unit 13 judges whether it is an edit end (Step S302), and, in an edit nd, (Y) ends operation at the time of edit.

[0031] When it is n t an dit nd (step S302;N), an editing-task company is operating a user int rfac 11, publishing commands (control information), such as r production, a rapid trav rs , and coma deliv ry, to the disk unit 21 for materials, displaying the picture of mat rial data on a monitor 23, and looking at this picture through a control unit 13, looks for th h ad positi n of a cut (n), and stops a picture in the position. And an diting-task company operates start point determinati n by pushing th predetermined switch in a user int rfac 11 etc. Th reby, the input f th start p int tim code variabl A is performed (St p S303). N xt, a control unit 13 is Flag Small. Cut judg s whether it is 0 (Step S304). Flag Small Wh n Cut is 0, a tim c d [in / th disk unit 22 f r work / in a tim

code / in / the disk unit 21 for mat rials / (Y) / in a control unit 13]] reproduces the data of the section from A to A+Taccs to the field of D to D+Taccs (Step S305), and time codes A and D are saved to the field of A (n) in th editing point information storage d vice 12, and D (n), respectively (Step S306).On th other hand, it is Flag Small. When Cut is not 0 (step S304;N), from D+Tcopied, a time code [in / the disk unit 22 for work / in the tim cod in th disk unit 21 for materials] overwrites th field of D+Taccs, and reproduces the data of th s ction from A t A+Taccs-Tcopied (Step S307), and a control unit 13 overwrit s and saves the value of A-Tcopied to th field of A (n) in th editing point information storage d vice 12 (Step S308).

[0032] If Step S306 or Step S308 is completed, an editing-task company is operating a user interface 11, will look for the ending point of a cut (n), and will operate ending point determination by pushing a switch etc. Thereby, the input of the ending point time code variable C is performed (Step S309). Next, a control unit 13 compares the tim from the start point of a cut to an ending point, i.e., C-A, and Taccs-Tcopied, and C-A judges whether it is more than Taccs-Tcopied (Step S310). (Y) sets Variable Tcopied to 00m00s00 f while a control unit 13 sets Flag SmallCut to 0, when C-A is more than Taccs-Tcopied (Step S311). Next, a control unit 13 saves the ending point time code variable C to the field of C (n) in the editing point information storage device 12 (Step S312). Next, a control unit 13 increments the cut number n one time (Step S313), equips the next edit with it, and returns to (Step S314) and Step S302 as D=D+Taccs. On the other hand, when C-A is not more than Taccs-Tcopied (step S310;N), a control unit 13 is Flag Small. While setting Cut to 1, it newly returns to Step S302 by setting to Tcopied the valu which added C-A to Tcopied (Step S315).

[0033] Here, after performing edit of a cut (1) as shown in drawing 3 (a), and a cut (2) to the material data recorded on the disk unit 21 for materials, as shown in drawing 8 (a), cut (3) 43 and cut (4) 44 are extracted, and the case where edit which connects is performed is considered. Drawing 8 (b) is a timing chart which shows the data recorded on the disk unit 22 for work at the time of this edit of cut (3) 43 and cut (4) 44. In drawing 8 (b), a sign 53 expresses a cut (3) and the sign 54 expresses the head portion of a cut (4). These cuts (3) In the disk unit 22 for work, the head portions 54 of 53 and a cut (4) pack an interval, and are recorded. Moreover, in drawing 8 (b), D3 expresses the point of a start of a cut (3), F4 expresses the point of a start of the head portion 54 of a cut (4), and D4 expresses the point of an end of the head portion 54 of a cut (4). Cut (3) The time Tcut3 of 53 is shorter than Taccs, and the time which doubled cut (3) 53 and the head portion 54 of a cut (4) serves as Taccs. Moreover, below, the time code of each point shown in drawing 8 (a) and (b) explains taking the case of the case where it is the value shown in drawing 10 .

[0034] At the time of the edit about the cut (1) shown in introduction and drawing 3 (a), and a cut (2), it sets to the flow chart shown in drawing 9 , and is Flag Small. Since Cut is set to 0 (step S304;Y) and C-A sets it more than Taccs-Tcopied (step S310;Y), operation at the time of edit becomes being the same as that of operation shown in drawing 2 , and edit is performed as the gestalt of the 1st operation explained Next, in the case of the edit about a cut (3), they are n= 3, and D= 00m02s00 f. An editing-task company looks for the head position of cut (3) 43, i.e., the point of A3, shown in drawing 8 (a), and operates start point determination by pushing the predetermined switch in a user interface 11 etc. Thereby, the start point time code variable A is set up with A=A3 (Step S303). this tim - - flag Small Cut — with 0 — it is (step S304;Y) — it is — as for a control unit 13, the time code in the disk unit 22 for work reproduces the data from A3 point [in / the section from A to A+Taccs, i.e., drawing 8 , (a) / in the tim code in the disk unit 21 for materials] to B3 point to the field of D to D+Taccs (Step S305) Under the present circumstances, although invalid data are reproduced after F4 in drawing 8 (b), this is not taken as a problem. A control unit 13 saves time codes A and D further to the field of A (3) in the editing point information storage devic 12, and D (3), respectively (Step S306). At this time, as shown in drawing 11 , editing point information will be recorded on the editing point information storage device 12.

[0035] Then, an editing-task company looks for the ending point, i.e., C3 point, of cut (3) 43 shown in drawing 8 (a), and operates ending point determination. Thereby, the ending point time code variable C is set up with C=C3. At this tim , a control unit 13 compares the time from the start point of a cut to an ending point, i.e., C-A, and Taccs-Tcopied, and C-A judges whether it is more than Taccs-Tcopied (Step S310). Here, when C-A is more than Taccs-Tcopied, it is the same as the case of a cut (1) or a cut (2). However, in the cut (3) shown in drawing 8 (a), the tim from A3 to C3 is smaller than Taccs. Moreover, Tcopied serves as 00m00s00 f at this time. Therefore, C-A becomes smaller than Taccs-Tcopied (step S310;N), and a control unit 13 is Flag Small. While setting Cut to 1, th valu which added C-A to Tcopied is newly set to Tcopied (Step S315). At this time, since Tcopied is 00m00s00 f, it s rves as Tcopied=C-A. Furthermore, a control unit 13 does not record the value of the point C, i.e., a time code variable, ending [cut] on the editing point information storage device 12 in this case. Moreover, n and a D value are not updated.

[0036] Next, an editing-task company looks for the head position of cut (4) 44, i.e., the point of A4, shown in drawing 8 (a), and operates start point determination by pushing the predetermined switch in a user interface 11 etc. Ther by, the start point time code variable A is set up with A=A4 (Step S303). Next, a control unit 13 is Flag Small. Cut is investigated (St p S304). after th nding point d termination f a cut (3), and flag Small Cut is set as 1 (step S304;N) — it is — a control unit 13 Th tim c d in the disk unit 21 for materials Th s ction fr m A to A+Taccs-Tcopi d, That is, fr m D+Tcopied, th tim c de in the disk unit 22 for work ov rwrit s th field of D+Taccs, i. ., a fi ld, from F4 point in drawing 8 (b), and r pr duc s th data from A4 point in drawing 8 (a) t E4 point (Step S307). Moreover, a control unit 13 ov rwrit s th value of A-Tcopi d t the field f A (n) in th diting p int informati n st rag device 12, and is sav d (Step S308). Although information is r c rded on the field of this tim A (3) as alr ady shown in drawing 11 , it v rwrit s h r and r cords on it.

[0037] Th n, an diting-task company looks for th nding point, i.e., C4 point, of cut (4) 44 shown in drawing 8 (a), and operates ending point determination. Thereby, the ending point time code variabl C is set up with C=C4. this time — C-A — more than Taccs-Tcopied — it is (step S310;Y) — a control unit 13 — flag Small Variabl Tcopied is set to 00m00s00 f while setting Cut to 0 (Step S311). Moreover, a control unit 13 saves th ending point time cod variabl C to th field of C (n) in th diting point information storag device 12 (St p S312). At this tim , as shown in drawing 12 , diting point information will b recorded on the editing point information storag devic 12. Thus, about the cut (3) shorter than Taccs among the cuts which had four from th first, lin ar editing is performed at the time of editing point determination, and all data are reproduced by the disk unit 22 for work. Therefore, sinc it is not necessary to carry out anything at the time of reproduction, the editing point information about a cut (3) is recorded on the editing point information storage device 12, and it is **. Therefore, the editing point information on th next cut (4) is recorded on the field of n= 3 in the editing point information storage device 12.

[0038] Operation at the time of the reproduction after edit of the edit equipment concerning the gestalt of this op ration is as having been shown in drawing 7 like the gestalt of the 1st operation. At the time of the reproduction at th time of editing about a cut (4) from a cut (1) like the above-mentioned explanation, first, while the disk unit 22 for work has read from D1 point in drawing 3 (b) to D2 point at the time of n= 1, the disk unit 21 for materials seeks to B1 point in drawing 3 (a). And after performing read-out from B1 point to C1 point in the disk unit 21 for materials after Taccs progress, while the disk unit 22 for work has read from D2 point in drawing 3 (b) to D3 point, the disk unit 21 for materials seeks at B-2 point in drawing 3 (a). Furthermore, in the disk unit 21 for materials, read-out from B-2 point to C2 point is performed after Taccs progress. Then, while the disk unit 22 for work has read from D3 point in drawing 8 (b) to D4 point, the disk unit 21 for materials seeks to E4 point in drawing 8 (a). And after Taccs progress, read-out from E4 point to C4 point is performed in the disk unit 21 for materials. That is, se king to the field of a cut (3) is not performed in the disk unit 21 for materials. About the data of a cut (3), the all ar reproduced by the disk unit 22 for work, and will be read from here.

[0039] It can be coped with, when it includes a cut shorter than Taccs according to the edit equipment concerning the gestalt of this operation, as explained above. The composition of others in the gestalt of this operation, operation, and the effect are the same as the gestalt of the 1st operation.

[0040] In addition, although this invention is not limited to the gestalt of each above-mentioned implementation, for example, showed the position of the data on a record medium by the time code with the gestalt of each above-mentioned implementation instead, it may use address information, such as a track number and a sector number.

[0041] Moreover, although the gestalt of each above-mentioned implementation explained the case where an editing-task company determined an editing point, this invention can be applied, when reading editing point information from the equipment connected to the exterior of edit equipment and performing edit and reproduction.

[0042] Moreover, although the gestalt of each above-mentioned implementation explained the example in the case of a combination used as the 1st storage which serves as an optical disk unit and the 2nd storage as a disk unit 21 for materials using the hard disk as a disk unit 22 for work, in the case of the combination of the storage with which access speed differs, this invention can apply a hard disk, semiconductor memory, etc. as a combination of the 1st storage and the 2nd storage.

[0043] Furthermore, it is also possible to use the late storage of access like an optical disk unit or a tape unit as th 2nd storage. It is because these information will be reproduced one by one at the time of reproduction if it records by packing an interval so that it may be set to D2=D1+Taccs as shown in drawing 3 (b) in case data are recorded on th r cord medium in the 2nd storage.

[0044] Moreover, if record sequential in this way and reproduction are performed, random access does not do th 2nd storage. That is, after record of the head portion of a cut (1) is completed [for example,] at the time of record, or after reproduction of the head portion of a cut (1) is completed at the time of reproduction, a head is already in th head portion of a cut (2), and especially a head does not need to move. Moreover, since it is sequential access, rotational delay can be seemingly abolished by using a read-ahead cache buffer. Therefore, even if it uses late storage of access, such as an optical disk unit and a tape unit, as the 2nd storage, the access time can be shortened enough.

[0045] Moreover, for the reason of having performed additional edit, when the data recorded on the 2nd storage stop being in agreement with reproductive turn, they can shorten the access time at the time of reproduction by rearranging data so that it may become the order of reproduction. After rearrangement of data once reads the data of the portion which rearranges and rearranges them, it is realizable by writing in again. Though such rearrangement is performed, since only the data near the editing point are recorded on the 2nd storage, there is little amount of data and there is little time which rearrangement takes.

[0046]

[Effect of the Invention] As explained above, in case an editing point is determined according to edit equipment according to claim 1 or 2 The data near [in material data] the editing point are reproduced to the 2nd storage from th 1st st rage in which th random access which stored mat rial data is possible. at th tim . f r production of th data after dit In case the data near th diting point ar r produced, whil reading th data first reproduc d by th 2nd storag and considering as reproduction data Whil having read th data r produc d by th 2nd storag , access t th data which should b r produc d in th 1st storage is perform d. Sinc it was mad t use th data which replaced with th data r ad from the 2nd storage, and w r read from th 1st storag as reproduction data after this acc ss was complet d Ev n if the numb r of editing points incr ases in material data storage, using the lat st rag f access, th eff ct that non-lin ar diting can be performed is don so, with ut r ducing a

reproduction data transfer rate.
[0047] Mor over, in cas th data near [in mat rial data] the diting point are reproduced from the 1st storage to th 2nd storag according to edit equipment according to claim 2 Since an interval is pack d and the data n ar the editing p int wer recorded on th 2nd storag according to th turn that the data near th editing point are reproduc d Even if it us s the lat storage of acc ss as the 2nd storag in addition to th above-mentioned effect, the eff ct that the access tim can b shortened enough is don so.

[Translation done.]

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TECHNICAL FIELD

[Th technical field to which invention belongs] this invention relates to the edit equipment for performing non-linear editing of image data or voice data using the storage in which random access is possible.

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PRIOR ART

[D scription of the Prior Art] The edit method conventionally performed when editing image data is the method of reproducing only the required portion of a material record medium and reproducing this one by one to another record medium. Generally, such an edit method is called linear editing. On the other hand, the edit method called non-linear editing using the storage in which random access, such as a hard disk drive unit, is possible is being circulated in recent years. In this non-linear editing, by a certain method, the position where the required image in a material record medium is recorded is determined, and this is memorized as editing point information, such as carrying out rapid-traverse reproduction of the material record medium in which random access is possible first. And at the time of reproduction, a desired image program can be acquired by performing random access to a material record medium according to editing point information.
[0003] In linear editing, in order to perform duplicate processing, the working hours which edit takes become longer than the reproduction time of the completed image program at least. On the other hand, in non-linear editing, it is rapid-traverse reproduction etc., and since what is necessary is just to determine even an editing point, the time which an editing task takes can be shortened. Thus, in non-linear editing, efficient work can be done in a short time taking advantage of the advantage of the storage in which random access is possible.

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EFFECT OF THE INVENTION

[Eff ct of the Invention] As explained above, in case an editing point is determined according to edit equipment according to claim 1 or 2 The data near [in material data] the editing point are reproduced to the 2nd storage from the 1st storage in which the random access which stored material data is possible. at the time of reproduction of the data after edit In case the data near the editing point are reproduced, while reading the data first reproduced by the 2nd storage and considering as reproduction data While having read the data reproduced by the 2nd storage, access to the data which should be reproduced in the 1st storage is performed. Since it was made to use the data which replaced with the data read from the 2nd storage, and were read from the 1st storage as reproduction data after this access was completed Even if the number of editing points increases in material data storage, using the late storage of access, the effect that non-linear editing can be performed is done so, without reducing a reproduction data transfer rate.
[0047] Moreover, it is since according to edit equipment according to claim 2 an interval is packed and the data near the editing point were recorded on the 2nd storage according to the turn that the data near the editing point are reproduced, when reproducing the data near [in material data] the editing point from the 1st storage to the 2nd storage. Even if it uses the late storage of access as the 2nd storage in addition to the above-mentioned effect, the effect that the access time can be shortened enough is done so.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, generally in non-linear editing, the disk unit is used as storage in which random access is possible. However, such a disk unit is not the reason in which perfect random acc ss is possible, and requires the time for seeking a head or performing rotational delay on the occasion of access. Especially, in an optical disk unit etc., generally the seek time and rotational delay are large, and these influences cannot be disregarded. For example, in non-linear editing, supposing it connects a different portion in a material record medium for every frame, when reproducing this, seek operation will occur for every frame. Thus, sinc one seeking must be performed whenever it reads to data of only one frame, the average transfer rate of read-out falls remarkably. If this average transfer rate is less than a required value, a reproduction image will become way piece **********. Thus, in the edit equipment which performs non-linear editing, in order to reproduce reproduction data at the transfer rate more than fixed continuously, the number of the editing points in a certain section will be restricted, and it depends for this limiting value on the access time of the storage in which random access is possible.

[0005] Therefore, generally as storage in which the random access in non-linear editing is possible, the quick hard disk drive unit of access etc. is more desirable than the late optical disk unit of access etc. However, on the other hand, an optical disk unit has the advantage of being suitable for recording material data, when using the image recorded outdoors, for example as material data, since the record medium is generally removable. In addition, although the advantage of the both sides of an optical disk unit and a hard disk can be harnessed once it reproduces the material data recorded with the optical disk unit to a hard disk, considering the time of a duplicate, the merit of non-linear editing that it can edit will be lost for a short time.

[0006] this invention was made in view of this trouble, and even if the number of the purpose of editing points incr ases in material data storage, using the late storage of access, it is to offer the edit equipment which enabled it to perform non-linear editing, without reducing a reproduction data transfer rate.

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MEANS

[M ans for Solving the Problem] In the edit equipment for the edit equipment of this invention performing non-linear editing of image data or voice data using the storage in which random access is possible It connects with the 2nd storage for storing the data near [in the 1st storage in which the random access which stored material data is possible, and material data] the editing point. In case an editing point is determined, the data near [in material data] the editing point are reproduced from the 1st storage to the 2nd storage. at the time of reproduction of th data after edit In case the data near the editing point are reproduced, while reading the data first reproduced by the 2nd storage and considering as reproduction data While having read the data reproduced by the 2nd storage, access to the data which should be reproduced in the 1st storage is performed. After this access is completed, it has the control means which change reproduction data from the data read from the 2nd storage to the data read from the 1st storage.

[0008] With this edit equipment, in case an editing point is determined, the data near [in material data] the editing point are reproduced by the 2nd storage from the 1st storage by control means. And at the time of reproduction of the data after edit, by control means, in case the data near the editing point are reproduced The data reproduced by th 2nd storage of introduction are read, and it considers as reproduction data. While the data reproduced by the 2nd storage are read, access to the data which should be reproduced in the 1st storage is performed. After this access is completed, reproduction data are changed from the data read from the 2nd storage to the data read from the 1st storage.

[0009]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained in detail with reference to a drawing.

[0010] Drawing 1 is the block diagram showing the structure of a system containing the edit equipment concerning th g stalt of operation of the 1st of this invention. The disk unit 21 for materials as the 1st storage in which the random access which this system was connected to the edit equipment 10 concerning the gestalt of this operation and this edit equipment 10, and stored material data is possible, It connected with edit equipment 10, and it conn cted with the disk unit 22 for work and the edit equipment 10 as the 2nd storage for storing the data near [in material data] the editing point, and has the monitor 23 for displaying a picture. It connected with the disk unit 21 for materials, the disk unit 22 for work, and the monitor 23, and edit equipment 10 is equipped with the control unit 13 as control means which control these while it connects with the editing point information storage device 12, and th user interface 11 and the editing point information storage device 12 for memorizing the information on the editing point in the user interface 11 and material data for performing operation of determining the editing point in material data and it controls these. Control information and data 31 are sent and received between a control unit 13, and the disk unit 21 for materials and the disk unit 22 for work, control information 32 is sent and received between a control unit 13 and a user interface 11, and the editing point information 33 is sent and received between a control unit 13 and the editing point information storage device 12. Moreover, a control unit 13 outputs the reproduction data 34 after edit.

[0011] The user interface 11 contains various kinds of switches, levers, etc. The editing point information recording d vice 12 is equipment for memorizing time codes, such as a start point of each cut, and an ending point, and consists of a hard disk, semiconductor memory, etc. The control unit 13 has CPU (central processing unit), ROM (r ad only memory) which stored the program which this CPU performs, and RAM (random access memory) used as a working area.

[0012] Both the disk unit 21 for materials and the disk unit 22 for work shall have the capacity to perform record and reproduction of image data or voice data, and the recorded data shall be managed by the time code. An optical disk unit is used as a disk unit 21 for materials, and a hard disk is used as a disk unit 22 for work.

[0013] The outline of operation of the edit equipment 10 applied to the gestalt of this operation here is explained. Here, it thinks taking the case of the case where use an optical disk unit as a disk unit 21 for materials, and a hard disk is used as a disk unit 22 for work. Sinc the laten ss of access of th ptical disk unit as a disk unit 21 for materials is cov red, when reproducing material data t a hard disk beforehand, it is not nec ssary to reproduc all th mat rial data to a hard disk. Namely, what is necessary is to reproduc only th data of th peri d which is quivalent t Taccs from a head, r sp ctiv ly in ach cut to connect, if maximum of the tim which seeking and rotati nal delay in an optical disk unit take is s t to Taccs. If it sets, in this way, in th cas of reproduction f the data aft r edit Th data read from th hard disk ar used as reproduction data b tw n Taccs(s) f th h ad of ach cut. in th meantim Aft r it p rforms acc ss to th data which should b r produc d in an ptical disk unit

and the p riod of Taccs passes The lateness of access of an optical disk unit is suppliable with changing so that the data which replac d with the data read from a hard disk, and were read from the optical disk unit may b used as reproduction data.

[0014] In ord r to realiz above-mention d processing, the proc dure of r producing the data of the period of Taccs from th head of each cut from an optical disk unit to a hard disk is requir d. by the way, a common optical disk unit — s tting — Taccs — at most — it is number doz ns to 100 m s conds On the other hand, an editing-task company det rmines an editing point, looking at the pictur near the diting point by rapid-trav rs reproduction etc., after giving near aim, in case an editing point is determined. Since it is the work whose human being does such work, although one editing point is determined, even if short, it takes several seconds. Therefore, though the data of the period of Taccs are reproduced from the head of a cut from an optical disk unit to a hard disk when an editing point is determined, it can carry out abbreviation disregard in time for an editing-task company.

[0015] In case an editing-task company determines an editing point with the edit equipment 10 concerning the form of this operation by the above idea using a user interface 11, a control unit 13 reproduces the data of the period of Taccs from the head of each cut from the disk unit 21 for materials (optical disk unit) to the disk unit 22 for work (hard disk) while making the editing point information storage device 12 memorize the information on an editing point. At the time of reproduction of the data after edit, moreover, a control unit 13 In case the data near the editing point are reproduced, while reading the data first reproduced by the disk unit 22 for work and considering as the reproduction data 34 After performing access to the data which should be reproduced in the disk unit 21 for materials in the meantime and completing this access, control which uses as the reproduction data 34 the data which replaced with the data read from the disk unit 22 for work, and were read from the disk unit 21 for materials is performed.

[0016] Next, operation of the edit equipment 10 concerning the form of this operation is explained concretely. Here, the maximum Taccs of the access time of this optical disk unit is assumed to be 1 second using the optical disk unit as a disk unit 21 for materials. An optical disk unit is loaded with the optical disk with which material data were recorded. Drawing 3 (a) is a timing chart which shows the position of the cut in the data recorded on the optical disk as a record medium in the disk unit 21 for materials. Hereafter, as shown in drawing 3 (a), the case where edit which extracts cut (1) 41 and cut (2) 42, and connects from the data recorded on the optical disk is performed is considered. In addition, in drawing 3 (a), A1 and C1 express the start point of cut (1) 41, and an ending point, respectively, and A2 and C2 express the start point of cut (2) 42, and the ending point, respectively. Tcut1 expresses the time of cut (1) 41, and Tcut2 expresses the time of cut (2) 42. Moreover, B1 expresses the point after Taccs progress from A1, and B-2 expresses the point after Taccs progress from A2.

[0017] When extracting and connecting cut (1) 41 and cut (2) 42 as mentioned above, with the form of this operation, the data of the portion (it is hereafter described as a head portion.) of the period of Taccs are reproduced from the head of each cut from the disk unit 21 for materials to the disk unit 22 for work. Drawing 3 (b) is a timing chart which shows the data recorded on the disk unit 22 for work. In this drawing 3 (b), a sign 51 expresses the head portion of a cut (1), and the sign 52 expresses the head portion of a cut (2). In the disk unit 22 for work, these head portions 51 and 52 pack an interval, and are recorded. Moreover, in drawing 3 (b), D1 expresses the point of a start of the head portion 51 of a cut (1), D2 expresses the point (it is the same as the point of an nd of the head portion 51 of a cut (1).) of a start of the head portion 52 of a cut (2), and D3 expresses the point of an nd of the head portion 52 of a cut (2).

[0018] Moreover, below, the time code of each point shown in drawing 3 (a) and (b) explains taking the case of the cas where it is the value shown in drawing 4 . In addition, with the notation of the time code shown in drawing 4 , two digits divided by m, s, and f shall express a part, a second, and a frame, and may be 1 second at 30 frames, respectively.

[0019] Drawing 2 is the flow chart showing operation at the time of edit of the edit equipment 10 concerning the form of this operation. At the time of this edit, a control unit 13 sets initial value of the cut number n to 1 as initial setting first. Moreover, although the copy place time code variable D used in order to show the points D1 and D2 in the disk unit 22 for work and — needs to point out the head of the suitable free area on the record medium in th disk unit 22 for work as initial value, it shall point out D1 point in drawing 3 (b), and sets it to D= 00m00s00 f here (Step S101). Next, a control unit 13 judges whether it is an edit end (Step S102), and, in an edit end, (Y) ends operation at the time of edit. In addition, directions of being an edit end are performed when an editing-task company operates a user interface 11.

[0020] When it is not an edit end (step S102;N) An editing-task company is operating a user interface 11, and minds a control unit 13. Publishing commands (control information), such as reproduction, a rapid traverse, and coma deliv ry, to the disk unit 21 for materials, displaying the picture of material data on a monitor 23, and looking at this picture Cut (1) The point of A1 in the head position (a), i.e., drawing 3 , of 41 is looked for, and a picture is stopped in the p siti n. And an diting-task company operates start point d t rmination by pushing th predetermined switch in a us r int rfac 11 tc. Th reby, th input of the start point time cod variabl A is p rformed, and it is set up with A=A1 (Step S103). In respons , as for a control unit 13, the tim code in th disk unit 22 for work r produc s th data from A1 p int [in / th s ction (a), i. . drawing 3 , from A to A+Taccs / in th time cod in the disk unit 21 for materials] t B1 point from th point f D, i. ., D1 point in drawing 3 (b), to a fi ld (Step S104). If th pictur is display d on a monitor 23 with the duplicat f data at this tim , an diting-task company can check an diting p int. N xt, a control unit 13 sav s th start p int tim cod variabl A and th c py plac tim c d

variable D to th field of A (n) in th editing point information storage devic 12, and D (n), respectiv ly (Step S105).

[0021] Next, an diting-task company is operating a user int rface 11, looks for th ending point of cut (1) 41, i.e., C1 point, and op rat s nding point det rmination by pushing a switch etc. Thereby, the input of th nding point tim code variable C is perform d, and it is s t up with C=C1 (Step S106). A control unit 13 saves this ending point tim code variabl C to the fi ld of C (n) in th diting point information storag d vic 12 (St p S107). At this time, as sh wn in drawing 5 , diting point information (A (1), C (1), D (1)) will be r cord d on th editing point information storage device 12. Next, a control unit 13 increments the cut number n one time (Step S108), equips the next edit with it, and as D=D+Taccs, as (Step S109) and D point out the free area of the degree in the disk unit 22 for work, i. ., D2 point, it returns to Step S102.

[0022] And an editing-task company looks for and determines a start point A2 and the ending point C2 similarly about cut 2 by performing Step S103 or Step S109 again. Thereby, the start point time code variable A and the ending point time code variable C are set up with A=A2 and C=C2, respectively. As for a control unit 13, the time code in the disk unit 22 for work reproduces the data from A2 point [in / the section (a) i.e., drawing 3 , from A to A+Taccs / in the time code in the disk unit 21 for materials] to B-2 point from the point of D, i.e., D2 point in drawing 3 (b), to a field. A control unit 13 saves each time code variables A, D, and C again to the field of A (n) in the editing point information storage device 12, D (n), and C (n), respectively. At this time, as shown in drawing 6 , editing point information will be recorded on the editing point information storage device 12.

[0023] An editing-task company does in this way, and determines an editing point one after another, and the information is recorded on the editing point information storage device 12.

[0024] Drawing 7 is the flow chart showing operation at the time of the reproduction after edit of the edit equipment 10 concerning the form of this operation. At the time of this reproduction, a control unit 13 sets initial value of the cut number n to 1 as initial setting first (Step S201). Next, a control unit 13 judges whether A (n) exists with reference to the editing point information storage device 12 (Step S202). When A (n) does not exist, (N) ends operation at the time of reproduction. When A (n) exists, a control unit 13 reads A (n), C (n), and D (n) from the editing point information storage device 12, and (Y) sets up the time code variables A, S, C, and D with A=A(n) S=A (n)+Taccs, C=C (n), and D=D (n), respectively. In addition, since it is n= 1, they are A=A(1) S=A(1)+Taccs, C=C (1), and D=D (1) here. Next, as for a control unit 13, according to these time code variables, a time code [in / the disk unit 22 for work / for the data of the head portion of a cut (1)] starts read-out from the point of D, i.e., D1 point in drawing 3 (b), (Step S204). With it, to the disk unit 21 for materials, a control unit 13 publishes an instruction so that a time code may seek at the point of S (Step S205). Here, S points have pointed out the point after Taccs, i.e., B1 point in drawing 3 (a), from A1 point. And after waiting (Step S206) and Taccs pass, only the time of Taccs ends read-out from the disk unit 22 for work (Step S207), and is changed from the disk unit 21 for materials which should already have completed seeking to read-out (Step S208). Then, a control unit 13 increments waiting (Step S209) and Variable n one time (Step S210), returns to Step S202, and moves from the time of C-S passing to regeneration of th next cut.

[0025] A control unit 13 sets up the time code variables A, S, C, and D with A=A(2) S=A(2)+Taccs, C=C (2), and D=D (2) with reference to the editing point information storage device 12, respectively. And a control unit 13 starts read-out according to these time code variables from D2 point [in / the point of D, i.e., drawing 3 , (b) / in a tim code / in / the disk unit 22 for work / for the data of the head portion of a cut (2)]]. With it, to the disk unit 21 for materials, a control unit 13 publishes an instruction so that a time code may seek at the point of S. Here, S points have pointed out the point after Taccs, i.e., B-2 point in drawing 3 (a), from A2 point. And after Taccs passes, read-out from the disk unit 22 for work is ended, and it changes from the disk unit 21 for materials which should already have completed seeking to read-out.

[0026] Thus, at the time of reproduction, data without a way piece are reproducible with reference to the data of th editing point information storage device 12 by reading data from the disk unit 22 for work, and the disk unit 21 for materials by turns.

[0027] As explained above, in case an editing point is determined according to the edit equipment 10 concerning th gestalt of this operation The data near [in material data] the editing point are reproduced from the disk unit 21 for materials to the disk unit 22 for work. at the time of reproduction of the data after edit In case the data near the diting point are reproduced, while reading the data first reproduced by the disk unit 22 for work and considering as reproduction data Access to the data which should be reproduced in the disk unit 21 for materials in the meantime is performed. Since it was made to use the data which replaced with the data read from the disk unit 22 for work, and were read from the disk unit 21 for materials as reproduction data after this access was completed Even if th number of editing points increases in the disk unit 21 for materials, using the late storage of access, non-linear editing can be performed without reducing a reproduction data transfer rate. Therefore, as a disk unit 21 for materials, even if access is slow, storage with the merit that a record medium is removable or that it is cheap can b used. For xampl , it is r alizabl to carry out non-lin ar editing of the material data record d with th camera on apparatus videocass tt recorder using th optical disk and the magn tic tape as a record medium, and to s nd th m out as it is.

[0028] N xt, th dit quipment conc rning th g stalt f op ration of th 2nd of this inv nti n is xplain d. D p nding on th cut to dit, the time may b sh rter than Taccs. Drawing 8 (a) is a timing chart which shows th p sition of th cut in th data r cord d on th disk unit 21 for materials, when it includ s such a cut. In additi n, in drawing 8 (a), A3 and C3 xpress th start point f cut (3) 43, and an ending p int, r spectively, and A4 and C4

xpr ss th start point of cut (4) 44, and th ending point, respectively. Tcut3 expresses the time of cut (3) 43, and Tcut4 expresses th tim of cut (4) 44. Moreover, B3 expresses th point after Taccs progress from A3, and B4 xpresses the point after Taccs progress from A4. Mor over, only Tcopied which mentions E4 later from B4 xpresses th front point. In th xampl shown in drawing 8 (a), the tim Tcut3 of cut (3) 43 is shorter than Taccs.

[0029] The edit quipm nt concerning th g stalt of this operation is th xampl which nabl d it to cope with it when above. Th fundamental composition of th dit equipm nt conc rning th gestalt of this op ration is as having been shown in drawing 1 like the gestalt of the 1st operation.

[0030] Drawing 9 is the flow chart showing operation at the time of edit of the edit equipment concerning the gestalt of this operation. In this operation, first, as initial setting, a control unit 13 sets initial value of the cut number n to 1, and sets the copy place time code variable D to 00m00s00 f. Furthermore, a control unit 13 is the flag Small which shows whether the time of a cut is shorter than a predetermined reference value. Cut is set to 0 and the variable Tcopied which shows the sum total time of the cut reproduced as a cut shorter than Taccs within Time Taccs is set to 00m00s00 f (Step S301). Next, a control unit 13 judges whether it is an edit end (Step S302), and, in an edit end, (Y) ends operation at the time of edit.

[0031] When it is not an edit end (step S302;N), an editing-task company is operating a user interface 11, publishing commands (control information), such as reproduction, a rapid traverse, and coma delivery, to the disk unit 21 for materials, displaying the picture of material data on a monitor 23, and looking at this picture through a control unit 13, looks for the head position of a cut (n), and stops a picture in the position. And an editing-task company operates start point determination by pushing the predetermined switch in a user interface 11 etc. Thereby, the input of the start point time code variable A is performed (Step S303). Next, a control unit 13 is Flag Small. Cut judges whether it is 0 (Step S304). Flag Small When Cut is 0, a time code [in / the disk unit 22 for work / in a time code / in / the disk unit 21 for materials / (Y) / in a control unit 13]] reproduces the data of the section from A to A+Taccs to the field of D to D+Taccs (Step S305), and time codes A and D are saved to the field of A (n) in the editing point information storage device 12, and D (n), respectively (Step S306) On the other hand, it is Flag Small. When Cut is not 0 (step S304;N), from D+Tcopied, a time code [in / the disk unit 22 for work / in the time code in the disk unit 21 for materials] overwrites the field of D+Taccs, and reproduces the data of the section from A to A+Taccs-Tcopied (Step S307), and a control unit 13 overwrites and saves the value of A-Tcopied to the field of A (n) in the editing point information storage device 12 (Step S308).

[0032] If Step S306 or Step S308 is completed, an editing-task company is operating a user interface 11, will look for the ending point of a cut (n), and will operate ending point determination by pushing a switch etc. Thereby, the input of the ending point time code variable C is performed (Step S309). Next, a control unit 13 compares the time from the start point of a cut to an ending point, i.e., C-A, and Taccs-Tcopied, and C-A judges whether it is more than Taccs-Tcopied (Step S310). (Y) sets Variable Tcopied to 00m00s00 f while a control unit 13 sets Flag SmallCut to 0, when C-A is more than Taccs-Tcopied (Step S311). Next, a control unit 13 saves the ending point time code variable C to the field of C (n) in the editing point information storage device 12 (Step S312). Next, a control unit 13 increments the cut number n one time (Step S313), equips the next edit with it, and returns to (St p S314) and Step S302 as D=D+Taccs. On the other hand, when C-A is not more than Taccs-Tcopied (step S310;N), a control unit 13 is Flag Small. While setting Cut to 1, it newly returns to Step S302 by setting to Tcopied the valu which added C-A to Tcopied (Step S315).

[0033] Here, after performing edit of a cut (1) as shown in drawing 3 (a), and a cut (2) to the material data record d on the disk unit 21 for materials, as shown in drawing 8 (a), cut (3) 43 and cut (4) 44 are extracted, and the case where edit which connects is performed is considered. Drawing 8 (b) is a timing chart which shows the data recorded on the disk unit 22 for work at the time of this edit of cut (3) 43 and cut (4) 44. In drawing 8 (b), a sign 53 expresses a cut (3) and the sign 54 expresses the head portion of a cut (4). These cuts (3) In the disk unit 22 for work, the head portions 54 of 53 and a cut (4) pack an interval, and are recorded. Moreover, in drawing 8 (b), D3 xpresses the point of a start of a cut (3), F4 expresses the point of a start of the head portion 54 of a cut (4), and D4 xpresses the point of an end of the head portion 54 of a cut (4). Cut (3) The time Tcut3 of 53 is shorter than Taccs, and the time which doubled cut (3) 53 and the head portion 54 of a cut (4) serves as Taccs. Moreover, below, the time code of each point shown in drawing 8 (a) and (b) explains taking the case of the case where it is the valu shown in drawing 10 .

[0034] At the time of the edit about the cut (1) shown in introduction and drawing 3 (a), and a cut (2), it sets to th flow chart shown in drawing 9 , and is Flag Small. Since Cut is set to 0 (step S304;Y) and C-A sets it more than Taccs-Tcopied (step S310;Y), operation at the time of edit becomes being the same as that of operation shown in drawing 2 , and edit is performed as the gestalt of the 1st operation explained Next, in the case of the edit about a cut (3), they are n= 3, and D= 00m02s00 f. An editing-task company looks for the head position of cut (3) 43, i.e., the point of A3, shown in drawing 8 (a), and operates start point determination by pushing the predetermined switch in a user interface 11 etc. Thereby, the start point time code variable A is set up with A=A3 (Step S303). this tim - - flag Small Cut — with 0 — it is (st p S304;Y) — it is — as for a c ntrol unit 13, th tim cod in th disk unit 22 for work reproduces the data from A3 p int [in / th s ction from A to A+Taccs, i. ., drawing 8 , (a) / in th time c de in th disk unit 21 for materials] to B3 point to the fi ld of D to D+Taccs (Step S305) Under the present circumstances, although invalid data are r produced aft r F4 in drawing 8 (b), this is not tak n as a pr blem. A control unit 13 saves tim c d s A and D furth r to th fi ld of A (3) in th diting p int inf rmati n storag devic 12, and D (3), resp ctiv ly (Step S306). At this tim , as shown in drawing 11 , diting point information will b recorded n th diting p int information st rag devic 12.

[0035] Then, an editing-task company looks for the ending point, i.e., C3 point, of cut (3) 43 shown in drawing 8 (a), and operat s ending point d termination. Thereby, th ending point time code variable C is set up with C=C3. At this time, a control unit 13 compares the time from the start point of a cut to an ending point, i. ., C-A, and Taccs-Tcopied, and C-A judges wh ther it is mor than Taccs-Tcopied (Step S310). H re, wh n C-A is more than Taccs-Tcopi d, it is th same as the cas of a cut (1) or a cut (2). How ver, in the cut (3) shown in drawing 8 (a), th time from A3 to C3 is smaller than Taccs. Mor over, Tcopi d serves as 00m00s00 f at this tim . Therefore, C-A becomes smaller than Taccs-Tcopied (step S310;N), and a control unit 13 is Flag Small. Whil setting Cut to 1, the value which added C-A to Tcopied is newly set to Tcopied (Step S315). At this time, since Tcopied is 00m00s00 f, it serves as Tcopied=C-A. Furthermore, a control unit 13 does not record the value of the point C, i.e., a time code variable, ending [cut] on the editing point information storage device 12 in this case. Moreover, n and a D value ar not updated.

[0036] Next, an editing-task company looks for the head position of cut (4) 44, i.e., the point of A4, shown in drawing 8 (a), and operates start point determination by pushing the predetermined switch in a user interface 11 etc. Th reby, the start point time code variable A is set up with A=A4 (Step S303). Next, a control unit 13 is Flag Small. Cut is investigated (Step S304). after the ending point determination of a cut (3), and flag Small Cut is set as 1 (step S304;N) — it is — a control unit 13 The time code in the disk unit 21 for materials The section from A to A+Taccs-Tcopied, That is, from D+Tcopied, the time code in the disk unit 22 for work overwrites the field of D+Taccs, i.e., a field, from F4 point in drawing 8 (b), and reproduces the data from A4 point in drawing 8 (a) to E4 point (Step S307). Moreover, a control unit 13 overwrites the value of A-Tcopied to the field of A (n) in the editing point information storage device 12, and is saved (Step S308). Although information is recorded on the field of this time A (3) as already shown in drawing 11 , it overwrites here and records on it.

[0037] Then, an editing-task company looks for the ending point, i.e., C4 point, of cut (4) 44 shown in drawing 8 (a), and operates ending point determination. Thereby, the ending point time code variable C is set up with C=C4. this time — C-A — more than Taccs-Tcopied — it is (step S310;Y) — a control unit 13 — flag Small Variable Tcopied is set to 00m00s00 f while setting Cut to 0 (Step S311). Moreover, a control unit 13 saves the ending point time code variable C to the field of C (n) in the editing point information storage device 12 (Step S312). At this time, as shown in drawing 12 , editing point information will be recorded on the editing point information storage device 12. Thus, about the cut (3) shorter than Taccs among the cuts which had four from the first, linear editing is performed at the time of editing point determination, and all data are reproduced by the disk unit 22 for work. Therefore, sinc it is not necessary to carry out anything at the time of reproduction, the editing point information about a cut (3) is recorded on the editing point information storage device 12, and it is **. Therefore, the editing point information on the next cut (4) is recorded on the field of n= 3 in the editing point information storage device 12.

[0038] Operation at the time of the reproduction after edit of the edit equipment concerning the gestalt of this op ration is as having been shown in drawing 7 like the gestalt of the 1st operation. At the time of the reproduction at the time of editing about a cut (4) from a cut (1) like the above-mentioned explanation, first, while the disk unit 22 for work has read from D1 point in drawing 3 (b) to D2 point at the time of n= 1, the disk unit 21 for materials seeks to B1 point in drawing 3 (a). And after performing read-out from B1 point to C1 point in the disk unit 21 for materials after Taccs progress, while the disk unit 22 for work has read from D2 point in drawing 3 (b) to D3 point, th disk unit 21 for materials seeks at B-2 point in drawing 3 (a). Furthermore, in the disk unit 21 for materials, read-out from B-2 point to C2 point is performed after Taccs progress. Then, while the disk unit 22 for work has read from D3 point in drawing 8 (b) to D4 point, the disk unit 21 for materials seeks to E4 point in drawing 8 (a). And aft r Taccs progress, read-out from E4 point to C4 point is performed in the disk unit 21 for materials. That is, s eking to the field of a cut (3) is not performed in the disk unit 21 for materials. About the data of a cut (3), the all ar reproduced by the disk unit 22 for work, and will be read from here.

[0039] It can be coped with, when it includes a cut shorter than Taccs according to the edit equipment concerning the g stalt of this operation, as explained above. The composition of others in the gestalt of this operation, op ration, and the effect are the same as the gestalt of the 1st operation.

[0040] In addition, although this invention is not limited to the gestalt of each above-mentioned implementation, for example, showed the position of the data on a record medium by the time code with the gestalt of each above-mentioned implementation instead, it may use address information, such as a track number and a sector number.

[0041] Moreover, although the gestalt of each above-mentioned implementation explained the case where an editing-task company determined an editing point, this invention can be applied, when reading editing point information from the equipment connected to the exterior of edit equipment and performing edit and reproduction.

[0042] Moreover, although the gestalt of each above-mentioned implementation explained the example in the cas of a combination used as the 1st storage which serves as an optical disk unit and the 2nd storage as a disk unit 21 for materials using the hard disk as a disk unit 22 for work, in the case of the combination of the storage with which access speed differs, this invention can apply a hard disk, semiconductor memory, etc. as a combination of the 1st storag and th 2nd storage.

[0043] Furthermore, it is also possibl to use the lat storage of acc ss like an optical disk unit or a tap unit as the 2nd storag . It is becaus th s information will b reproduced one by one at th tim of r production if it records by packing an int rval so that it may b s t to D2=D1+Taccs as sh wn in drawing 3 (b) in cas data ar r c rded on th r cord m dium in th 2nd st rag .

[0044] M r over, if r cord s quential in this way and reproduction ar perform d, rand m acc ss d s not do th 2nd storag . That is, aft r r cord of th head portion of a cut (1) is compl ted [for example,] at th tim of r cord,

or aft r reproduction of the head portion of a cut (1) is completed at the tim of reproduction, a head is already in the head portion of a cut (2), and specially a head does not need to move. Moreov r, sinc it is s quential access, rotational delay can b seemingly abolished by using a read-ahead cache buffer. Therefore, even if it uses lat storag of access, such as an optical disk unit and a tape unit, as the 2nd storag , the access tim can b short ned enough.

[0045] Moreover, for th r ason of having performed additional edit, when th data r cord d on th 2nd storag stop b ing in agreement with reproductiv turn, they can shorten the access tim at the time of reproduction by r arranging data so that it may become the order of reproduction. After rearrangement of data once reads the data of the portion which rearranges and rearranges them, it is realizable by writing in again. Though such rearrangement is performed, since only the data near the editing point are recorded on the 2nd storage, there is little amount of data and there is little time which rearrangement takes.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the structure of a system containing the edit equipment concerning the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the flow chart showing operation at the time of edit of the edit equipment concerning the gestalt of operation of the 1st of this invention.
[Drawing 3] It is explanatory drawing for explaining operation of the edit equipment concerning the gestalt of operation of the 1st of this invention.
[Drawing 4] It is explanatory drawing showing the time code of each point shown in drawing 3 .
[Drawing 5] It is explanatory drawing showing the editing point information recorded on an editing point information storage device in the edit equipment concerning the gestalt of operation of the 1st of this invention.
[Drawing 6] It is explanatory drawing showing the editing point information recorded on an editing point information storage device in the edit equipment concerning the gestalt of operation of the 1st of this invention.
[Drawing 7] It is the flow chart showing operation at the time of the reproduction after edit of the edit equipment concerning the gestalt of operation of the 1st of this invention.
[Drawing 8] It is explanatory drawing for explaining operation of the edit equipment concerning the gestalt of operation of the 2nd of this invention.
[Drawing 9] It is the flow chart showing operation at the time of edit of the edit equipment concerning the gestalt of operation of the 2nd of this invention.
[Drawing 10] It is explanatory drawing showing the time code of each point shown in drawing 8 .
[Drawing 11] It is explanatory drawing showing the editing point information recorded on an editing point information storage device in the edit equipment concerning the gestalt of operation of the 2nd of this invention.
[Drawing 12] It is explanatory drawing showing the editing point information recorded on an editing point information storage device in the edit equipment concerning the gestalt of operation of the 2nd of this invention.
[Description of Notations]
10 [— An editing point information storage device 13 / — A control unit, 21 / — The disk unit for materials, 22 / — — The disk unit for work, 23 / — Monitor] — Edit equipment, 11 — A user interface, 12

[Translation done.]

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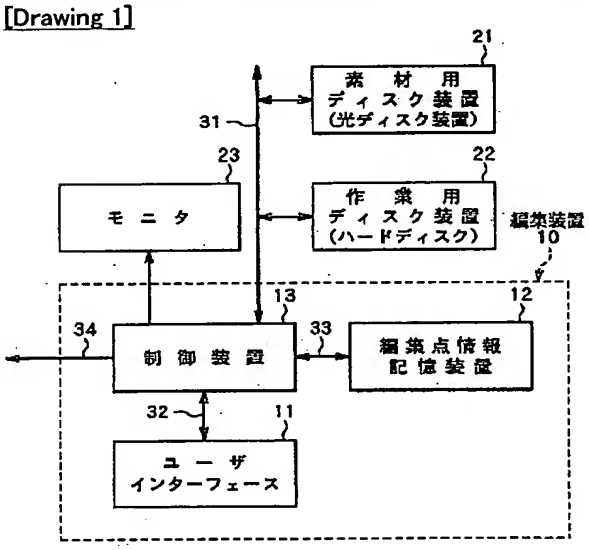
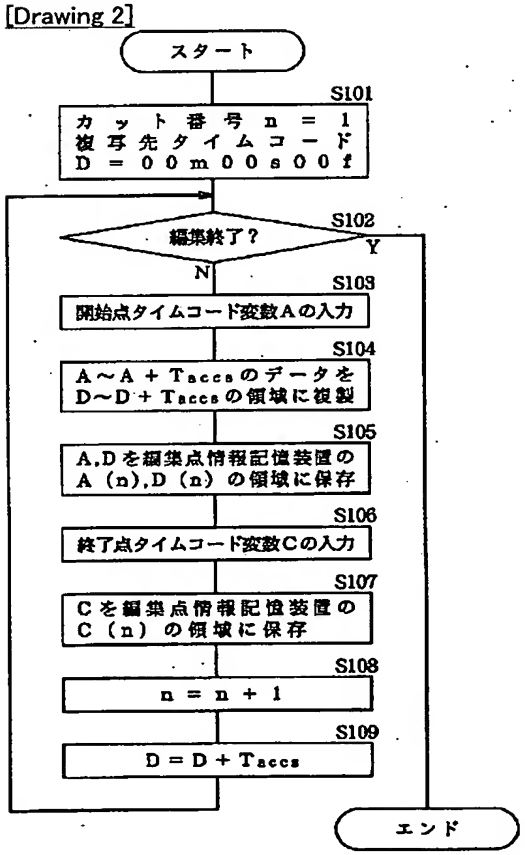
DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 4]

	タイムコード
A1	01m00s00f
B1	01m01s01f
C1	01m10s00f
A2	02m00s00f
B2	02m01s00f
C2	02m30s00f
D1	00m00s00f
D2	00m01s00f
D3	00m02s00f

[Drawing 5]

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2			
3			

[Drawing 6]

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2	02m00s00f	02m30s00f	00m01s00f
3			

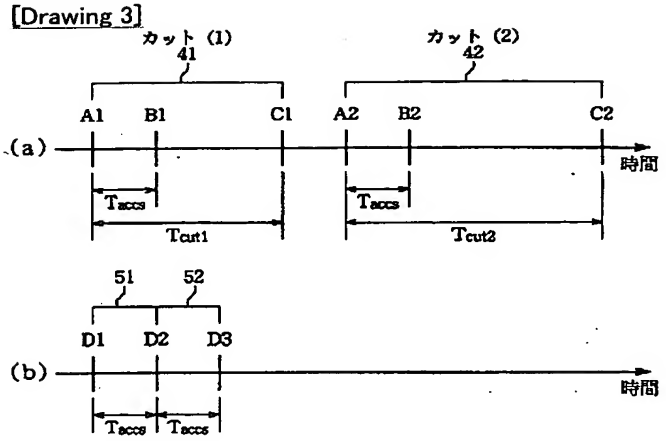
[Drawing 10]

	タイムコード
A3	10m00s00f
C3	10m00s10f
B3	10m01s00f
A4	20m00s00f
E4	20m00s20f
B4	20m01s00f
C4	20m10s00f
D3	00m02s00f
F4	00m02s10f

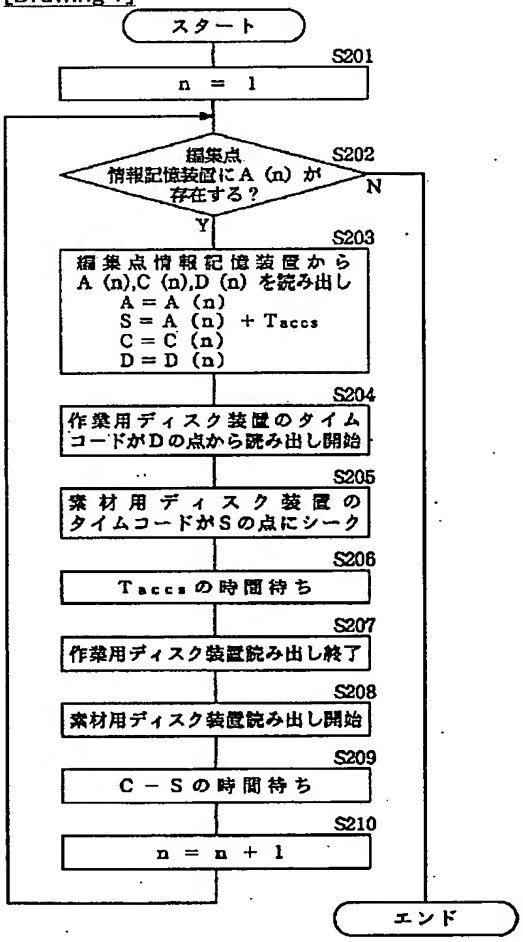
[Drawing 11]

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2	02m00s00f	02m30s00f	00m01s00f
3	10m00s00f		00m02s00f
4			

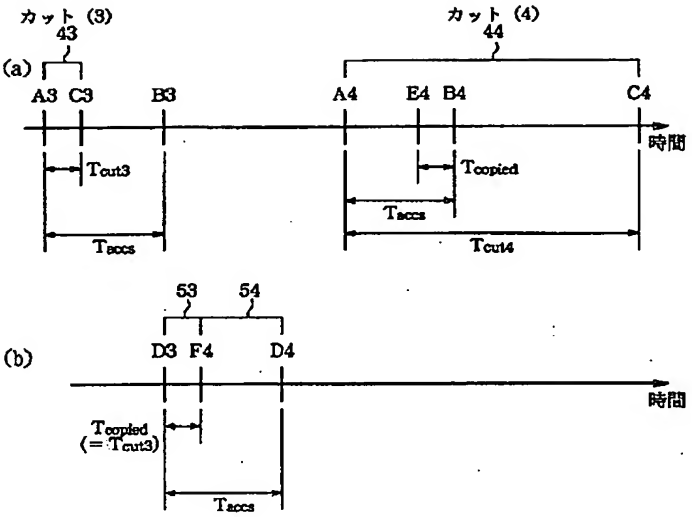
[Drawing 3]



[Drawing 7]



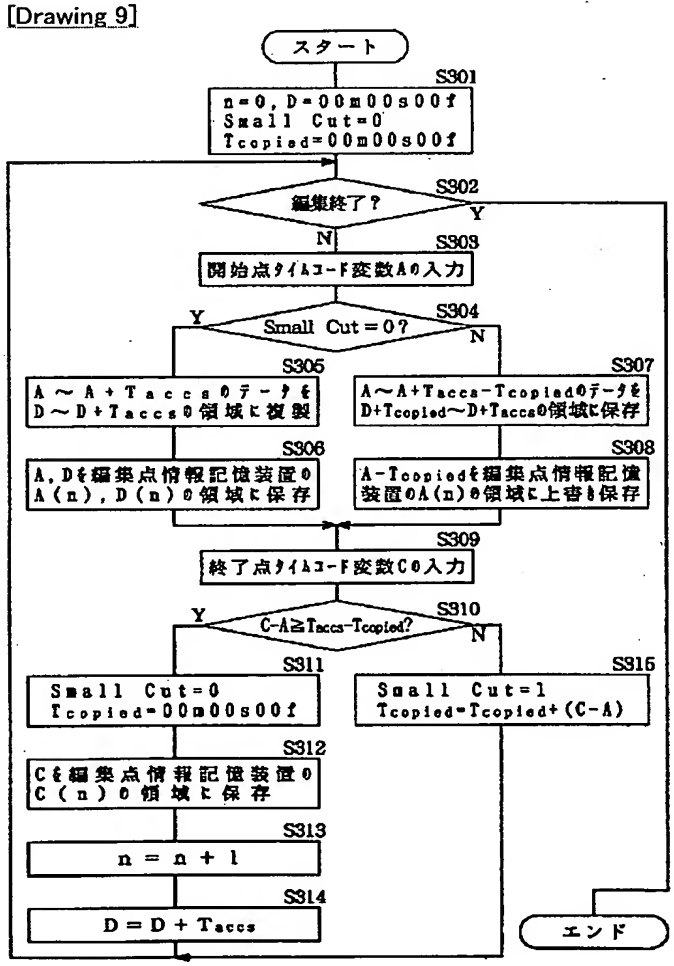
[Drawing 8]



[Drawing 12]

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2	02m00s00f	02m30s00f	00m01s00f
3	19m59s20f	20m10s00f	00m02s00f
4			

[Drawing 9]



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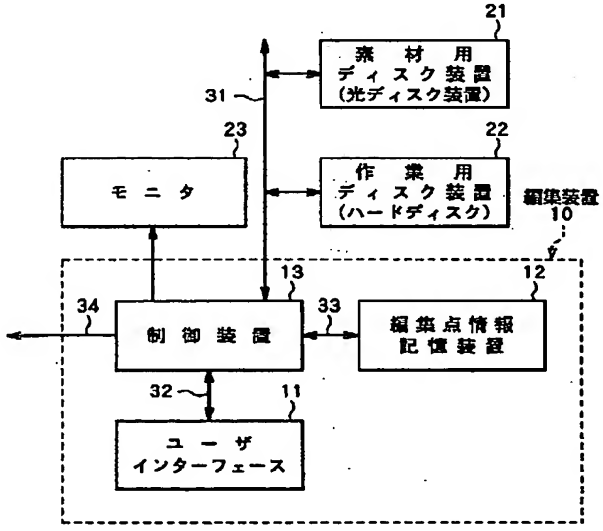
(54)【発明の名称】　編集装置

(57)【要約】

【課題】　素材データ格納用にアクセスの遅い記憶装置を用い、且つ編集点の数が多くなっても、再生データの転送レートを低下させることなくノンリニア編集を行うことができるようにする。

【解決手段】　制御装置１３は、編集点を決定する際に、素材データ中の編集点近傍のデータを、素材用ディスク装置２１から作業用ディスク装置２２に複製しておき、編集後のデータの再生時には、編集点近傍のデータを再生する際に、始めに作業用ディスク装置２２に複製されているデータを読み出して再生データとすると共に、その間に、素材用ディスク装置２１において再生すべきデータへのアクセスを行い、このアクセスが完了してから、素材用ディスク装置２１から読み出したデータを再生データとする。



【特許請求の範囲】
【請求項１】　ランダムアクセスが可能な記憶装置を用いて映像データまたは音声データのノンリニア編集を行うための編集装置において、
素材データを格納したランダムアクセスが可能な第１の記憶装置および素材データ中の編集点近傍のデータを格納するための第２の記憶装置に接続され、編集点を決定する際に、素材データ中の編集点近傍のデータを第１の記憶装置から第２の記憶装置に複製しておき、編集後のデータの再生時には、編集点近傍のデータを再生する際に、始めに第２の記憶装置に複製されているデータを読み出して再生データとすると共に、第２の記憶装置に複製されているデータを読み出している間に、第１の記憶装置において再生すべきデータへのアクセスを行い、このアクセスが完了した後、再生データを、第２の記憶装置から読み出したデータから第１の記憶装置から読み出したデータに切り替える制御手段を備えたことを特徴とする編集装置。
【請求項２】　前記制御手段は、素材データ中の編集点近傍のデータを第１の記憶装置から第２の記憶装置に複製する際に、編集点近傍のデータが再生される順番に従って、間隔を詰めて、編集点近傍のデータを第２の記憶装置に記録することを特徴とする請求項１記載の編集装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、ランダムアクセスが可能な記憶装置を用いて映像データまたは音声データのノンリニア編集を行うための編集装置に関する。
【０００２】
【従来の技術】映像データを編集する場合において、従来より行われてきた編集方法は、素材記録媒体の必要部分のみを再生し、これを別の記録媒体に順次複製する方法である。一般に、このような編集方法をリニア編集と呼ぶ。これに対し、近年、ハードディスク装置等のランダムアクセスが可能な記憶装置を用いたノンリニア編集と呼ばれる編集方法が広まりつつある。このノンリニア編集では、まず、ランダムアクセスが可能な素材記録媒体を早送り再生する等、何らかの方法で、素材記録媒体中の必要な映像が記録されている位置を決定し、これを編集点情報として記憶しておく。そして、再生時には、編集点情報に従って素材記録媒体に対してランダムアクセスを行うことで、所望の映像プログラムを得ることができる。
【０００３】リニア編集では、複製処理を行うため、編集に要する作業時間は、少なくとも、完成した映像プログラムの再生時間よりも長くなる。これに対し、ノンリニア編集においては、早送り再生等で、編集点さえ決定してやれば良いため、編集作業に要する時間を短縮することができる。このように、ノンリニア編集においては、ランダムアクセスが可能な記憶装置の利点を活かして、短時間で効率的な作業を行うことができる。
【０００４】
【発明が解決しようとする課題】ところで、一般に、ノンリニア編集においては、ランダムアクセスが可能な記憶装置として、ディスク装置が用いられている。しかしながら、このようなディスク装置は、完全なランダムアクセスが可能なわけではなく、アクセスに際して、ヘッドのシークを行ったり、回転待ちを行ったりするための時間を要する。特に、光ディスク装置等においては、一般にシーク時間や回転待ち時間が大きく、これらの影響を無視できない。例えば、ノンリニア編集において、１フレーム毎に素材記録媒体における異なる部分をつないだとすると、これを再生するときには、１フレーム毎にシーク動作が発生することになる。このように、たった１フレームのデータに読み出す毎に、１回のシークを行わなければならないのであるから、読み出しの平均転送レートは著しく低下する。この平均転送レートが、必要な値を下回ると、再生映像は途切れてしまうことになる。このように、ノンリニア編集を行う編集装置においては、再生データを連続して一定以上の転送レートで再生させるためには、ある区間での編集点の数が制限されることになり、この制限値は、ランダムアクセスが可能な記憶装置のアクセス時間に依存する。
【０００５】従って、ノンリニア編集におけるランダムアクセスが可能な記憶装置としては、一般的にアクセスの遅い光ディスク装置等よりも、アクセスの速いハードディスク装置等の方が好ましい。しかし一方、光ディスク装置は、一般に記録媒体がリムーバブルであるから、例えば屋外で収録した映像を素材データとして用いる場合等において、素材データを記録するのに適しているという利点がある。なお、光ディスク装置で収録した素材データを一旦ハードディスクに複製すれば、光ディスク装置とハードディスクの双方の利点を活かすことができるが、複製の時間を考えると、短時間で編集が可能であるというノンリニア編集のメリットが失われてしまう。
【０００６】本発明はかかる問題点に鑑みてなされたもので、その目的は、素材データ格納用にアクセスの遅い記憶装置を用い、且つ編集点の数が多くなっても、再生データの転送レートを低下させることなくノンリニア編集を行うことができるようにした編集装置を提供することにある。
【０００７】
【課題を解決するための手段】本発明の編集装置は、ランダムアクセスが可能な記憶装置を用いて映像データまたは音声データのノンリニア編集を行うための編集装置において、素材データを格納したランダムアクセスが可能な第１の記憶装置および素材データ中の編集点近傍のデータを格納するための第２の記憶装置に接続され、編集点を決定する際に、素材データ中の編集点近傍のデー

タを第１の記憶装置から第２の記憶装置に複製しておき、編集後のデータの再生時には、編集点近傍のデータを再生する際に、始めに第２の記憶装置に複製されているデータを読み出して再生データとすると共に、第２の記憶装置に複製されているデータを読み出している間に、第１の記憶装置において再生すべきデータへのアクセスを行い、このアクセスが完了した後、再生データを、第２の記憶装置から読み出したデータから第１の記憶装置から読み出したデータに切り替える制御手段を備えたものである。

【０００８】この編集装置では、編集点を決定する際には、制御手段によって、素材データ中の編集点近傍のデータが第１の記憶装置から第２の記憶装置に複製される。そして、編集後のデータの再生時には、制御手段によって、編集点近傍のデータを再生する際に、始めに第２の記憶装置に複製されているデータが読み出されて再生データとされ、第２の記憶装置に複製されているデータが読み出されている間に、第１の記憶装置において再生すべきデータへのアクセスが行われ、このアクセスが完了した後、再生データが、第２の記憶装置から読み出されたデータから第１の記憶装置から読み出されたデータに切り替えられる。

【０００９】

【発明の実施の形態】以下、本発明の実施の形態について図面を参照して詳細に説明する。

【００１０】図１は本発明の第１の実施の形態に係る編集装置を含むシステムの構成を示すブロック図である。このシステムは、本実施の形態に係る編集装置１０と、この編集装置１０に接続され、素材データを格納したランダムアクセスが可能な第１の記憶装置としての素材用ディスク装置２１と、編集装置１０に接続され、素材データ中の編集点近傍のデータを格納するための第２の記憶装置としての作業用ディスク装置２２と、編集装置１０に接続され、画像を表示するためのモニタ２３とを備えている。編集装置１０は、素材データにおける編集点を決定する操作を行うためのユーザインタフェース１１と、素材データにおける編集点の情報を記憶するための編集点情報記憶装置１２と、ユーザインタフェース１１および編集点情報記憶装置１２に接続され、これらを制御すると共に、素材用ディスク装置２１、作業用ディスク装置２２およびモニタ２３に接続され、これらを制御する制御手段としての制御装置１３とを備えている。制御装置１３と素材用ディスク装置２１，作業用ディスク装置２２との間では制御情報およびデータ３１が送受され、制御装置１３とユーザインタフェース１１の間では制御情報３２が送受され、制御装置１３と編集点情報記憶装置１２の間では編集点情報３３が送受されるようになっている。また、制御装置１３は、編集後の再生データ３４を出力するようになっている。

【００１１】ユーザインタフェース１１は、各種のスイッチやレバー等を含んでいる。編集点情報記録装置１２は、各カットの開始点，終了点等のタイムコードを記憶するための装置であり、ハードディスクや半導体メモリ等で構成される。制御装置１３は、ＣＰＵ（中央処理装置）と、このＣＰＵが実行するプログラム等を格納したＲＯＭ（リード・オンリ・メモリ）と、ワーキングエリアとなるＲＡＭ（ランダム・アクセス・メモリ）とを有している。

【００１２】素材用ディスク装置２１および作業用ディスク装置２２は、共に、映像データまたは音声データの記録および再生を行う能力を持ち、記録されたデータは、タイムコードで管理されるものとする。素材用ディスク装置２１としては例えば光ディスク装置が使用され、作業用ディスク装置２２としては例えばハードディスクが使用される。

【００１３】ここで、本実施の形態に係る編集装置１０の動作の概略について説明する。ここでは、素材用ディスク装置２１として光ディスク装置を使用し、作業用ディスク装置２２としてハードディスクを使用する場合を例にとって考える。素材用ディスク装置２１としての光ディスク装置のアクセスの遅さをカバーするために、予め素材データをハードディスクに複製する場合には、素材データの全てをハードディスクに複製する必要はない。すなわち、光ディスク装置におけるシークおよび回転待ちに要する時間の最大値をT_{accs}とすると、つなぎ合わせる各カットにおいて、それぞれ先頭からT_{accs}に相当する期間のデータのみを複製しておけば良い。こうしておけば、編集後のデータの再生の際には、各カットの先頭のT_{accs}の間はハードディスクから読み出したデータを再生データとし、この間に、光ディスク装置において再生すべきデータへのアクセスを行い、T_{accs}の期間が経過した後は、ハードディスクから読み出すデータに代えて光ディスク装置から読み出したデータを再生データとするように切り替えることで、光ディスク装置のアクセスの遅さを補うことができる。

【００１４】上述の処理を実現するには、各カットの先頭からT_{accs}の期間のデータを光ディスク装置からハードディスクに複製するという手順が必要である。ところで、一般的な光ディスク装置においては、T_{accs}は、たかだか数十から数百m秒である。一方、編集作業者は、編集点を決定する際、早送り再生等により、おおよその見当をつけた後、編集点近傍の画像を見ながら、編集点を決定する。このような作業は、人間が行う作業であるから、一つの編集点を決定するのに、短くても数秒を要する。従って、編集点を決定した際に、カットの先頭からT_{accs}の期間のデータを光ディスク装置からハードディスクに複製したとしても、それは、編集作業者にとって、時間的に略無視できるものである。

【００１５】以上の考えにより、本実施の形態に係る編集装置１０では、編集作業者がユーザインタフェース１

１を用いて編集点を決定する際に、制御装置１３は、編集点の情報を編集点情報記憶装置１２に記憶させると共に、各カットの先頭からT_{accs}の期間のデータを素材用ディスク装置（光ディスク装置）２１から作業用ディスク装置（ハードディスク）２２に複製しておく。また、編集後のデータの再生時には、制御装置１３は、編集点近傍のデータを再生する際に、始めに作業用ディスク装置２２に複製されているデータを読み出して再生データ３４とすると共に、その間に、素材用ディスク装置２１において再生すべきデータへのアクセスを行い、このアクセスが完了した後、作業用ディスク装置２２から読み出したデータに代えて素材用ディスク装置２１から読み出したデータを再生データ３４とするような制御を行う。

【００１６】次に、本実施の形態に係る編集装置１０の動作について具体的に説明する。ここでは、素材用ディスク装置２１としての光ディスク装置を用い、この光ディスク装置のアクセス時間の最大値T_{accs}を１秒と仮定する。光ディスク装置には、素材データの収録された光ディスクが装填される。図３（ａ）は、素材用ディスク装置２１における記録媒体としての光ディスクに記録されたデータ中におけるカットの位置を示すタイミングチャートである。以下、図３（ａ）に示したように、光ディスクに記録されたデータから、カット（１）４１とカット（２）４２を抜き出して、つなぎ合わせる編集を行う場合について考える。なお、図３（ａ）において、Ａ１，Ｃ１はそれぞれカット（１）４１の開始点，終了点を表し、Ａ２，Ｃ２はそれぞれカット（２）４２の開始点，終了点を表している。T_{cut1}はカット（１）４１の時間を表し、T_{cut2}はカット（２）４２の時間を表している。また、Ｂ１はＡ１からT_{accs}経過後の点を表し、Ｂ２はＡ２からT_{accs}経過後の点を表している。

【００１７】上述のようにカット（１）４１とカット（２）４２を抜き出して、つなぎ合わせる場合、本実施の形態では、各カットの先頭からT_{accs}の期間の部分（以下、先頭部分と記す。）のデータが、素材用ディスク装置２１から作業用ディスク装置２２に複製される。図３（ｂ）は、作業用ディスク装置２２に記録されたデータを示すタイミングチャートである。この図３（ｂ）において、符号５１はカット（１）の先頭部分を表し、符号５２はカット（２）の先頭部分を表している。これら先頭部分５１，５２は、作業用ディスク装置２２において間隔を詰めて記録される。また、図３（ｂ）において、Ｄ１はカット（１）の先頭部分５１の開始の点を表し、Ｄ２はカット（２）の先頭部分５２の開始の点（カット（１）の先頭部分５１の終了の点と同じ。）を表し、Ｄ３はカット（２）の先頭部分５２の終了の点を表している。

【００１８】また、以下では、図３（ａ），（ｂ）に示した各点のタイムコードが、図４に示した値である場合を例にとって説明する。なお、図４に示したタイムコードの表記では、ｍ，ｓ，ｆで区切られた２桁の数字が、それぞれ、分，秒，フレームを表すものとし、３０フレームで１秒とする。

【００１９】図２は、本実施の形態に係る編集装置１０の編集時の動作を示す流れ図である。この編集時には、まず、制御装置１３は、初期設定として、カット番号ｎの初期値を１とする。また、作業用ディスク装置２２における点Ｄ１，Ｄ２，…を示すために使用される複写先タイムコード変数Ｄは、初期値として、作業用ディスク装置２２における記録媒体上の適当な空き領域の先頭を指している必要があるが、ここでは、図３（ｂ）におけるＤ１点を指すものとし、Ｄ＝００ｍ００ｓ００ｆとする（ステップＳ１０１）。次に、制御装置１３は、編集終了か否かを判断し（ステップＳ１０２）、編集終了の場合（Ｙ）は、編集時の動作を終了する。なお、編集終了か否かの指示は、編集作業者がユーザインタフェース１１を操作することによって行う。

【００２０】編集終了ではない場合（ステップＳ１０２；Ｎ）は、編集作業者は、ユーザインタフェース１１を操作することで、制御装置１３を介して、素材用ディスク装置２１に対して再生，早送り，コマ送りといったコマンド（制御情報）を発行し、モニタ２３に素材データの画像を表示させ、この画像を見ながら、カット（１）４１の先頭位置すなわち図３（ａ）におけるＡ１の点を探し、その位置で画像を停止させる。そして、編集作業者は、ユーザインタフェース１１における所定のスイッチを押す等により、開始点決定の操作を行う。これにより、開始点タイムコード変数Ａの入力が行われ、Ａ＝Ａ１と設定される（ステップＳ１０３）。これを受けて、制御装置１３は、素材用ディスク装置２１におけるタイムコードがＡからＡ＋T_{accs}までの区間すなわち図３（ａ）におけるＡ１点からＢ１点までのデータを、作業用ディスク装置２２におけるタイムコードがＤの点、すなわち図３（ｂ）におけるＤ１点からの領域に複製する（ステップＳ１０４）。このとき、データの複製と共に、その画像をモニタ２３に表示すれば、編集作業者は、編集点の確認を行うことができる。次に、制御装置１３は、開始点タイムコード変数Ａおよび複写先タイムコード変数Ｄを、それぞれ、編集点情報記憶装置１２におけるＡ（ｎ），Ｄ（ｎ）の領域に保存する（ステップＳ１０５）。

【００２１】次に、編集作業者は、ユーザインタフェース１１を操作することで、カット（１）４１の終了点すなわちＣ１点を探し、スイッチを押す等により、終了点決定の操作を行う。これにより、終了点タイムコード変数Ｃの入力が行われ、Ｃ＝Ｃ１と設定される（ステップＳ１０６）。制御装置１３は、この終了点タイムコード変数Ｃを、編集点情報記憶装置１２におけるＣ（ｎ）の領域に保存する（ステップＳ１０７）。この時点で、編

集点情報記憶装置１２には、図５に示すように編集点情報（Ａ（１），Ｃ（１），Ｄ（１））が記録されることになる。次に、制御装置１３は、カット番号ｎを１インクリメントし（ステップＳ１０８）、次の編集に備えて、Ｄ＝Ｄ＋T_{accs}として（ステップＳ１０９）、Ｄが作業用ディスク装置２２における次の空き領域すなわちＤ２点を指すようにして、ステップＳ１０２に戻る。

【００２２】そして、再びステップＳ１０３ないしステップＳ１０９を実行することで、編集作業者は、カット２についても同様に、開始点Ａ２および終了点Ｃ２を探し、決定する。これにより、開始点タイムコード変数Ａおよび終了点タイムコード変数Ｃは、それぞれ、Ａ＝Ａ２、Ｃ＝Ｃ２と設定される。制御装置１３は、素材用ディスク装置２１におけるタイムコードがＡからＡ＋T_{accs}までの区間すなわち図３（ａ）におけるＡ２点からＢ２点までのデータを、作業用ディスク装置２２におけるタイムコードがＤの点、すなわち図３（ｂ）におけるＤ２点からの領域に複製する。制御装置１３は、また、各タイムコード変数Ａ，Ｄ，Ｃを、それぞれ、編集点情報記憶装置１２におけるＡ（ｎ），Ｄ（ｎ），Ｃ（ｎ）の領域に保存する。この時点で、編集点情報記憶装置１２には、図６に示すように編集点情報が記録されることになる。

【００２３】編集作業者は、このようにして、次々と編集点を決定し、その情報は編集点情報記憶装置１２に記録されていく。

【００２４】図７は、本実施の形態に係る編集装置１０の編集後の再生時の動作を示す流れ図である。この再生時には、まず、制御装置１３は、初期設定として、カット番号ｎの初期値を１とする（ステップＳ２０１）。次に、制御装置１３は、編集点情報記憶装置１２を参照して、Ａ（ｎ）が存在するか否かを判断する（ステップＳ２０２）。Ａ（ｎ）が存在しない場合（Ｎ）は、再生時の動作を終了する。Ａ（ｎ）が存在する場合（Ｙ）は、制御装置１３は、編集点情報記憶装置１２から、Ａ（ｎ），Ｃ（ｎ），Ｄ（ｎ）を読み出し、タイムコード変数Ａ，Ｓ，Ｃ，Ｄをそれぞれ、Ａ＝Ａ（ｎ），Ｓ＝Ａ（ｎ）＋T_{accs}，Ｃ＝Ｃ（ｎ），Ｄ＝Ｄ（ｎ）と設定する。なお、ここでは、ｎ＝１であるから、Ａ＝Ａ（１），Ｓ＝Ａ（１）＋T_{accs}，Ｃ＝Ｃ（１），Ｄ＝Ｄ（１）である。次に、制御装置１３は、これらのタイムコード変数に従って、カット（１）の先頭部分のデータを、作業用ディスク装置２２におけるタイムコードがＤの点、すなわち図３（ｂ）におけるＤ１点から読み出しを開始する（ステップＳ２０４）。それと共に、制御装置１３は、素材用ディスク装置２１に対して、タイムコードがＳの点にシークを行うように命令を発行する（ステップＳ２０５）。ここで、Ｓ点は、Ａ１点からT_{accs}後の点、すなわち図３（ａ）におけるＢ１点を指している。そして、T_{accs}の時間だけ待ち（ステップＳ２０６）、T_{accs}が経過した後、作業用ディスク装置２２からの読み出しを終了し（ステップＳ２０７）、既にシークの完了しているはずの素材用ディスク装置２１からの読み出しに切り替える（ステップＳ２０８）。その後、制御装置１３は、Ｃ－Ｓの時間が経過するのを待ち（ステップＳ２０９）、変数ｎを１インクリメントして（ステップＳ２１０）、ステップＳ２０２に戻って、次のカットの再生処理に移る。

【００２５】制御装置１３は、編集点情報記憶装置１２を参照して、タイムコード変数Ａ，Ｓ，Ｃ，Ｄをそれぞれ、Ａ＝Ａ（２），Ｓ＝Ａ（２）＋T_{accs}，Ｃ＝Ｃ（２），Ｄ＝Ｄ（２）と設定する。そして、制御装置１３は、これらのタイムコード変数に従って、カット（２）の先頭部分のデータを、作業用ディスク装置２２におけるタイムコードがＤの点、すなわち図３（ｂ）におけるＤ２点から読み出しを開始する。それと共に、制御装置１３は、素材用ディスク装置２１に対して、タイムコードがＳの点にシークを行うように命令を発行する。ここで、Ｓ点は、Ａ２点からT_{accs}後の点、すなわち図３（ａ）におけるＢ２点を指している。そして、T_{accs}が経過した後、作業用ディスク装置２２からの読み出しを終了し、既にシークの完了しているはずの素材用ディスク装置２１からの読み出しに切り替える。

【００２６】このように、再生時には、編集点情報記憶装置１２のデータを参照して、作業用ディスク装置２２と素材用ディスク装置２１から交互にデータを読み出していくことで、途切れのないデータを再生することができる。

【００２７】以上説明したように本実施の形態に係る編集装置１０によれば、編集点を決定する際に、素材データ中の編集点近傍のデータを、素材用ディスク装置２１から作業用ディスク装置２２に複製しておき、編集後のデータの再生時には、編集点近傍のデータを再生する際に、始めに作業用ディスク装置２２に複製されているデータを読み出して再生データとすると共に、その間に、素材用ディスク装置２１において再生すべきデータへのアクセスを行い、このアクセスが完了した後、作業用ディスク装置２２から読み出したデータに代えて素材用ディスク装置２１から読み出したデータを再生データとするようにしたので、素材用ディスク装置２１にアクセスの遅い記憶装置を用い、且つ編集点の数が多くなっても、再生データの転送レートを低下させることなくノンリニア編集を行うことができる。従って、素材用ディスク装置２１として、アクセスが遅くても、記録媒体がリムーバブルあるいは安価といったメリットのある記憶装置を用いることができる。例えば、光ディスクや磁気テープを記録媒体として用いたカメラ一体型ビデオレコーダで収録した素材データを、ノンリニア編集し、そのまま送り出すといったことを実現することができる。

【００２８】次に、本発明の第２の実施の形態に係る編

集装置について説明する。編集するカットによっては、その時間がT_{accs}よりも短い場合もあり得る。図８（ａ）は、このようなカットを含む場合において、素材用ディスク装置２１に記録されたデータ中におけるカットの位置を示すタイミングチャートである。なお、図８（ａ）において、Ａ３，Ｃ３はそれぞれカット（３）４３の開始点，終了点を表し、Ａ４，Ｃ４はそれぞれカット（４）４４の開始点，終了点を表している。T_{cut3}はカット（３）４３の時間を表し、T_{cut4}はカット（４）４４の時間を表している。また、Ｂ３はＡ３からT_{accs}経過後の点を表し、Ｂ４はＡ４からT_{accs}経過後の点を表している。また、Ｅ４は、Ｂ４から後述するT_{copied}だけ前の点を表している。図８（ａ）に示した例では、カット（３）４３の時間T_{cut3}がT_{accs}よりも短くなっている。

【００２９】本実施の形態に係る編集装置は、上述のような場合に対処することができるようにした例である。本実施の形態に係る編集装置の基本的な構成は、第１の実施の形態と同様に、図１に示した通りである。

【００３０】図９は、本実施の形態に係る編集装置の編集時の動作を示す流れ図である。この動作では、まず、制御装置１３は、初期設定として、カット番号ｎの初期値を１とし、複写先タイムコード変数Ｄを００ｍ００ｓ００ｆとする。更に、制御装置１３は、カットの時間が所定の基準値よりも短いか否かを示すフラグＳｍａｌｌ　Ｃｕｔを０とし、時間T_{accs}内において、T_{accs}よりも短いカットとして複製されているカットの合計時間を示す変数T_{copied}を００ｍ００ｓ００ｆとする（ステップＳ３０１）。次に、制御装置１３は、編集終了か否かを判断し（ステップＳ３０２）、編集終了の場合（Ｙ）は、編集時の動作を終了する。

【００３１】編集終了ではない場合（ステップＳ３０２；Ｎ）は、編集作業者は、ユーザインタフェース１１を操作することで、制御装置１３を介して、素材用ディスク装置２１に対して再生，早送り，コマ送りといったコマンド（制御情報）を発行し、モニタ２３に素材データの画像を表示させ、この画像を見ながら、カット（ｎ）の先頭位置を探し、その位置で画像を停止させる。そして、編集作業者は、ユーザインタフェース１１における所定のスイッチを押す等により、開始点決定の操作を行う。これにより、開始点タイムコード変数Ａの入力が行われる（ステップＳ３０３）。次に、制御装置１３は、フラグＳｍａｌｌ　Ｃｕｔが０か否かを判断する（ステップＳ３０４）。フラグＳｍａｌｌ　Ｃｕｔが０の場合（Ｙ）は、制御装置１３は、素材用ディスク装置２１におけるタイムコードがＡからＡ＋T_{accs}までの区間のデータを、作業用ディスク装置２２におけるタイムコードがＤからＤ＋T_{accs}の領域に複製し（ステップＳ３０５）、タイムコードＡ，Ｄを、それぞれ、編集点情報記憶装置１２におけるＡ（ｎ），Ｄ（ｎ）の領域に保存する（ステップＳ３０６）。一方、フラグＳｍａｌｌ　Ｃｕｔが０ではない場合（ステップＳ３０４；Ｎ）は、制御装置１３は、素材用ディスク装置２１におけるタイムコードがＡからＡ＋T_{accs}－T_{copied}までの区間のデータを、作業用ディスク装置２２におけるタイムコードがＤ＋T_{copied}からＤ＋T_{accs}の領域に上書きして複製し（ステップＳ３０７）、Ａ－T_{copied}の値を、編集点情報記憶装置１２におけるＡ（ｎ）の領域に上書きして保存する（ステップＳ３０８）。

【００３２】ステップＳ３０６またはステップＳ３０８が終了したら、編集作業者は、ユーザインタフェース１１を操作することで、カット（ｎ）の終了点を探し、スイッチを押す等により、終了点決定の操作を行う。これにより、終了点タイムコード変数Ｃの入力が行われる（ステップＳ３０９）。次に、制御装置１３は、カットの開始点から終了点までの時間すなわちＣ－Ａと、T_{accs}－T_{copied}とを比較し、Ｃ－ＡがT_{accs}－T_{copied}以上か否かを判断する（ステップＳ３１０）。Ｃ－ＡがT_{accs}－T_{copied}以上の場合（Ｙ）は、制御装置１３は、フラグＳｍａｌｌＣｕｔを０とすると共に、変数T_{copied}を００ｍ００ｓ００ｆとする（ステップＳ３１１）。次に、制御装置１３は、終了点タイムコード変数Ｃを、編集点情報記憶装置１２におけるＣ（ｎ）の領域に保存する（ステップＳ３１２）。次に、制御装置１３は、カット番号ｎを１インクリメントし（ステップＳ３１３）、次の編集に備えて、Ｄ＝Ｄ＋T_{accs}として（ステップＳ３１４）、ステップＳ３０２に戻る。一方、Ｃ－ＡがT_{accs}－T_{copied}以上ではない場合（ステップＳ３１０；Ｎ）は、制御装置１３は、フラグＳｍａｌｌ　Ｃｕｔを１とすると共に、T_{copied}にＣ－Ａを加えた値を新たにT_{copied}として（ステップＳ３１５）、ステップＳ３０２に戻る。

【００３３】ここで、素材用ディスク装置２１に記録された素材データに対して、図３（ａ）に示したようなカット（１）とカット（２）の編集を行った後に、図８（ａ）に示したように、カット（３）４３とカット（４）４４を抜き出して、つなぎ合わせる編集を行う場合について考える。図８（ｂ）は、このカット（３）４３とカット（４）４４の編集時に、作業用ディスク装置２２に記録されるデータを示すタイミングチャートである。図８（ｂ）において、符号５３はカット（３）を表し、符号５４はカット（４）の先頭部分を表している。これらカット（３）５３とカット（４）の先頭部分５４は、作業用ディスク装置２２において間隔を詰めて記録される。また、図８（ｂ）において、Ｄ３はカット（３）の開始の点を表し、Ｆ４はカット（４）の先頭部分５４の開始の点を表し、Ｄ４はカット（４）の先頭部分５４の終了の点を表している。カット（３）５３の時間T_{cut3}はT_{accs}よりも短く、カット（３）５３とカット（４）の先頭部分５４とを合わせた時間がT_{accs}とな

っている。また、以下では、図８（ａ），（ｂ）に示した各点のタイムコードが、図１０に示した値である場合を例にとって説明する。

【００３４】始めに、図３（ａ）に示したカット（１）とカット（２）についての編集時は、図９に示した流れ図において、フラグＳｍａｌｌ　Ｃｕｔは０（ステップＳ３０４；Ｙ）、Ｃ－Ａは$T_{accs}-T_{copied}$以上（ステップＳ３１０；Ｙ）となるため、編集時の動作は、図２に示した動作と同様になり、第１の実施の形態で説明した通りに編集が行われる。次に、カット（３）についての編集の際には、ｎ＝３、Ｄ＝００ｍ０２ｓ００ｆとなっている。編集作業者は、図８（ａ）に示したカット（３）４３の先頭位置すなわちＡ３の点を探し、ユーザインタフェース１１における所定のスイッチを押す等により、開始点決定の操作を行う。これにより、開始点タイムコード変数Ａは、Ａ＝Ａ３と設定される（ステップＳ３０３）。この時点で、フラグＳｍａｌｌ　Ｃｕｔは０のままである（ステップＳ３０４；Ｙ）ので、制御装置１３は、素材用ディスク装置２１におけるタイムコードがＡからＡ＋T_{accs}までの区間、すなわち図８（ａ）におけるＡ３点からＢ３点までのデータを、作業用ディスク装置２２におけるタイムコードがＤからＤ＋T_{accs}の領域に複製する（ステップＳ３０５）。この際、図８（ｂ）におけるＦ４点以降には無効なデータが複製されるが、これは問題としない。制御装置１３は、更に、タイムコードＡ，Ｄを、それぞれ編集点情報記憶装置１２におけるＡ（３），Ｄ（３）の領域に保存する（ステップＳ３０６）。この時点で、編集点情報記憶装置１２には、図１１に示すように編集点情報が記録されることになる。

【００３５】続いて、編集作業者は、図８（ａ）に示したカット（３）４３の終了点すなわちＣ３点を探し、終了点決定の操作を行う。これにより、終了点タイムコード変数Ｃは、Ｃ＝Ｃ３と設定される。このとき、制御装置１３は、カットの開始点から終了点までの時間すなわちＣ－Ａと、$T_{accs}-T_{copied}$とを比較し、Ｃ－Ａが$T_{accs}-T_{copied}$以上か否かを判断する（ステップＳ３１０）。ここで、Ｃ－Ａが$T_{accs}-T_{copied}$以上の場合はカット（１）またはカット（２）の場合と同じである。しかし、図８（ａ）に示したカット（３）では、Ａ３からＣ３までの時間はT_{accs}よりも小さい。また、この時点で、T_{copied}は００ｍ００ｓ００ｆとなっている。従って、Ｃ－Ａは$T_{accs}-T_{copied}$よりも小さくなり（ステップＳ３１０；Ｎ）、制御装置１３は、フラグＳｍａｌｌ　Ｃｕｔを１とすると共に、T_{copied}にＣ－Ａを加えた値を新たにT_{copied}とする（ステップＳ３１５）。この時点では、T_{copied}は００ｍ００ｓ００ｆであるので、T_{copied}＝Ｃ－Ａとなる。更に、この場合、制御装置１３は、カット終了点すなわちタイムコード変数Ｃの値を、編集点情報記憶装置１２に記録しない。また、ｎおよびＤの値を更新しない。

【００３６】次に、編集作業者は、図８（ａ）に示したカット（４）４４の先頭位置すなわちＡ４の点を探し、ユーザインタフェース１１における所定のスイッチを押す等により、開始点決定の操作を行う。これにより、開始点タイムコード変数Ａは、Ａ＝Ａ４と設定される（ステップＳ３０３）。次に、制御装置１３は、フラグＳｍａｌｌ　Ｃｕｔを調べる（ステップＳ３０４）。カット（３）の終了点決定後、フラグＳｍａｌｌ　Ｃｕｔは１に設定されている（ステップＳ３０４；Ｎ）ので、制御装置１３は、素材用ディスク装置２１におけるタイムコードがＡからＡ＋$T_{accs}-T_{copied}$までの区間、すなわち図８（ａ）におけるＡ４点からＥ４点までのデータを、作業用ディスク装置２２におけるタイムコードがＤ＋T_{copied}からＤ＋T_{accs}の領域、すなわち図８（ｂ）におけるＦ４点からの領域に上書きして複製する（ステップＳ３０７）。また、制御装置１３は、Ａ－T_{copied}の値を、編集点情報記憶装置１２におけるＡ（ｎ）の領域に上書きして保存する（ステップＳ３０８）。このときＡ（３）の領域には、既に図１１に示したように情報が記録されているが、ここに上書きして記録する。

【００３７】続いて、編集作業者は、図８（ａ）に示したカット（４）４４の終了点すなわちＣ４点を探し、終了点決定の操作を行う。これにより、終了点タイムコード変数Ｃは、Ｃ＝Ｃ４と設定される。このとき、Ｃ－Ａが$T_{accs}-T_{copied}$以上である（ステップＳ３１０；Ｙ）ので、制御装置１３は、フラグＳｍａｌｌ　Ｃｕｔを０とすると共に、変数T_{copied}を００ｍ００ｓ００ｆとする（ステップＳ３１１）。また、制御装置１３は、終了点タイムコード変数Ｃを、編集点情報記憶装置１２におけるＣ（ｎ）の領域に保存する（ステップＳ３１２）。この時点で、編集点情報記憶装置１２には、図１２に示すように編集点情報が記録されることになる。このように、元々４つあったカットのうち、T_{accs}よりも短いカット（３）については、編集点決定時にリニア編集が行われ、全てのデータが作業用ディスク装置２２に複製されている。従って、再生時には何もする必要がないので、編集点情報記憶装置１２にはカット（３）についての編集点情報は記録されてい。従って、編集点情報記憶装置１２におけるｎ＝３の領域には、次のカット（４）の編集点情報が記録されている。

【００３８】本実施の形態に係る編集装置の編集後の再生時の動作は、第１の実施の形態と同様に図７に示した通りである。上記説明のようにカット（１）からカット（４）について編集を行った場合における再生時には、まず、ｎ＝１のとき、作業用ディスク装置２２が図３（ｂ）におけるＤ１点からＤ２点までを読み出している間に、素材用ディスク装置２１は、図３（ａ）におけるＢ１点にシークを行う。そして、T_{accs}経過後に、素材用ディスク装置２１においてＢ１点からＣ１点までの読

み出しを行った後、作業用ディスク装置２２が図３（ｂ）におけるＤ２点からＤ３点までを読み出している間に、素材用ディスク装置２１は、図３（ａ）におけるＢ２点にシークを行う。更に、T_{accs}経過後に、素材用ディスク装置２１においてＢ２点からＣ２点までの読み出しを行う。続いて、作業用ディスク装置２２が図８（ｂ）におけるＤ３点からＤ４点までを読み出している間に、素材用ディスク装置２１は、図８（ａ）におけるＥ４点にシークを行う。それからT_{accs}経過後に、素材用ディスク装置２１においてＥ４点からＣ４点までの読み出しを行う。すなわち、素材用ディスク装置２１では、カット（３）の領域へのシークは行わない。カット（３）のデータについては、その全てが作業用ディスク装置２２に複製されており、ここから読み出されることになる。

【００３９】以上説明したように、本実施の形態に係る編集装置によれば、T_{accs}よりも短いカットを含む場合にも対処することができる。本実施の形態におけるその他の構成、動作および効果は、第１の実施の形態と同様である。

【００４０】なお、本発明は上記各実施の形態に限定されず、例えば、上記各実施の形態では、記録媒体上のデータの位置を、タイムコードで示すようにしたが、その代わりに、トラック番号やセクタ番号等のアドレス情報を用いても良い。

【００４１】また、上記各実施の形態では、編集作業者が編集点を決定する場合について説明したが、本発明は、編集装置の外部に接続された装置から編集点情報を読み込んで、編集，再生を行う場合にも適用することができる。

【００４２】また、上記各実施の形態では、第１の記憶装置となる素材用ディスク装置２１として光ディスク装置、第２の記憶装置となる作業用ディスク装置２２としてハードディスクを用いた組み合わせの場合の例について説明したが、本発明は、第１の記憶装置と第２の記憶装置の組み合わせとして、ハードディスクと半導体メモリ等、アクセス速度の異なる記憶装置の組み合わせの場合に適用することができる。

【００４３】更に、第２の記憶装置としては、光ディスク装置やテープ装置等のようにアクセスの遅い記憶装置を用いることも可能である。なぜならば、第２の記憶装置における記録媒体にデータを記録する際、図３（ｂ）に示したように、$D2=D1+T_{accs}$となるように間隔を詰めて記録を行えば、再生時には、これらの情報が順次再生されるからである。

【００４４】また、このようにシーケンシャルな記録，再生を行うのであれば、第２の記憶装置はランダムアクセスができなくても良い。すなわち、記録時において、例えばカット（１）の先頭部分の記録が終了した後、あるいは再生時においてカット（１）の先頭部分の再生が終了した後、ヘッドは、既にカット（２）の先頭部分にあり、ヘッドは特に移動する必要がない。また、シーケンシャルなアクセスであるため、先読みキャッシュバッファを用いることで、回転待ち時間を見かけ上無くすことができる。従って、第２の記憶装置として光ディスク装置やテープ装置等のアクセスの遅い記憶装置を用いても、アクセス時間を十分短くすることができる。

【００４５】また、もし、追加編集を行った等の理由により、第２の記憶装置に記録されたデータが、再生の順番と一致しなくなった場合には、再生順となるようにデータの並べ替えを行うことで、再生時のアクセス時間を短縮することができる。データの並べ替えは、例えば、並べ替えを行う部分のデータを一旦読み出し、並べ替えた後に再度書き込むことで実現することができる。このような並べ替えを行ったとしても、第２の記憶装置には、編集点近傍のデータしか記録されていないため、データ量は少なく、並べ替えに要する時間は少ない。

【００４６】

【発明の効果】以上説明したように請求項１または２記載の編集装置によれば、編集点を決定する際に、素材データ中の編集点近傍のデータを、素材データを格納したランダムアクセスが可能な第１の記憶装置から第２の記憶装置に複製しておき、編集後のデータの再生時には、編集点近傍のデータを再生する際に、始めに第２の記憶装置に複製されているデータを読み出して再生データとすると共に、第２の記憶装置に複製されているデータを読み出している間に、第１の記憶装置において再生すべきデータへのアクセスを行い、このアクセスが完了した後、第２の記憶装置から読み出したデータに代えて第１の記憶装置から読み出したデータを再生データとするようにしたので、素材データ格納用にアクセスの遅い記憶装置を用い、且つ編集点の数が多くなっても、再生データの転送レートを低下させることなくノンリニア編集を行うことができるという効果を奏する。

【００４７】また、請求項２記載の編集装置によれば、素材データ中の編集点近傍のデータを第１の記憶装置から第２の記憶装置に複製する際に、編集点近傍のデータが再生される順番に従って、間隔を詰めて，編集点近傍のデータを第２の記憶装置に記録するようにしたので、上記効果に加え、第２の記憶装置としてアクセスの遅い記憶装置を用いても、アクセス時間を十分短くすることができるという効果を奏する。

【図面の簡単な説明】

【図１】本発明の第１の実施の形態に係る編集装置を含むシステムの構成を示すブロック図である。

【図２】本発明の第１の実施の形態に係る編集装置の編集時の動作を示す流れ図である。

【図３】本発明の第１の実施の形態に係る編集装置の動作を説明するための説明図である。

【図４】図３に示した各点のタイムコードを示す説明図

である。

【図５】本発明の第１の実施の形態に係る編集装置において編集点情報記憶装置に記録される編集点情報を示す説明図である。

【図６】本発明の第１の実施の形態に係る編集装置において編集点情報記憶装置に記録される編集点情報を示す説明図である。

【図７】本発明の第１の実施の形態に係る編集装置の編集後の再生時の動作を示す流れ図である。

【図８】本発明の第２の実施の形態に係る編集装置の動作を説明するための説明図である。

【図９】本発明の第２の実施の形態に係る編集装置の編集時の動作を示す流れ図である。

【図１０】図８に示した各点のタイムコードを示す説明図である。

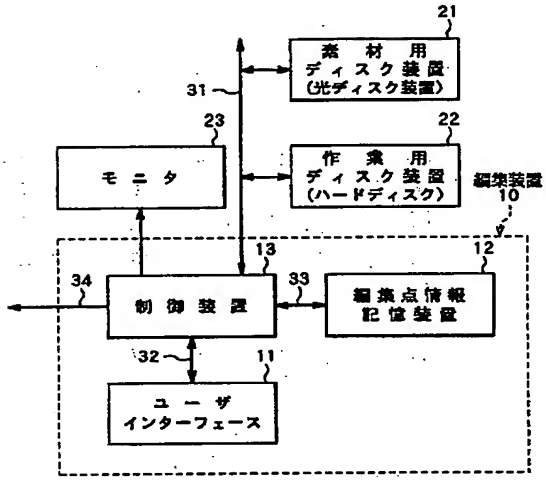
【図１１】本発明の第２の実施の形態に係る編集装置において編集点情報記憶装置に記録される編集点情報を示す説明図である。

【図１２】本発明の第２の実施の形態に係る編集装置において編集点情報記憶装置に記録される編集点情報を示す説明図である。

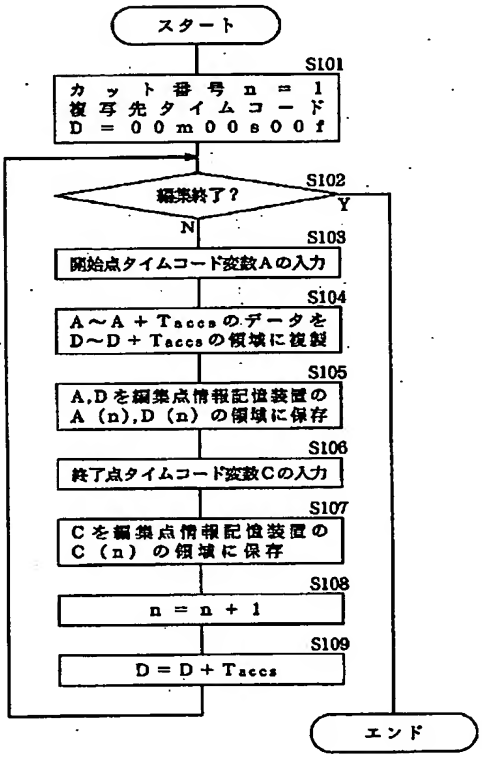
【符号の説明】

１０…編集装置、１１…ユーザインタフェース、１２…編集点情報記憶装置、１３…制御装置、２１…素材用ディスク装置、２２…作業用ディスク装置、２３…モニタ

【図１】



【図２】



【図４】

	タイムコード
A1	01m00s00f
B1	01m01s01f
C1	01m10s00f
A2	02m00s00f
B2	02m01s00f
C2	02m30s00f
D1	00m00s00f
D2	00m01s00f
D3	00m02s00f

【図１０】

	タイムコード
A3	10m00s00f
C3	10m00s10f
B3	10m01s00f
A4	20m00s00f
E4	20m00s20f
B4	20m01s00f
C4	20m10s00f
D3	00m02s00f
F4	00m02s10f

【図５】

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2			
3			

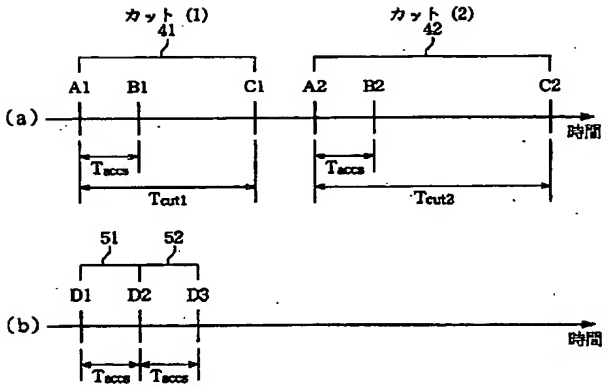
【図６】

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2	02m00s00f	02m30s00f	00m01s00f
3			

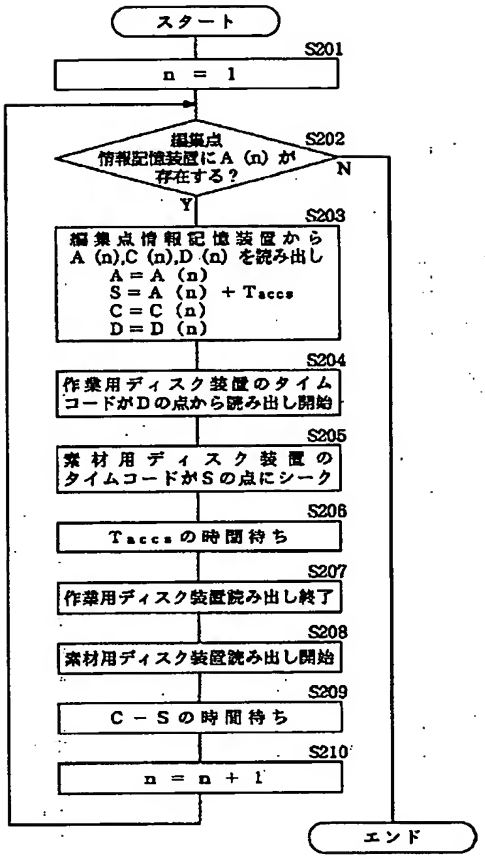
【図１１】

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2	02m00s00f	02m30s00f	00m01s00f
3	10m00s00f		00m02s00f
4			

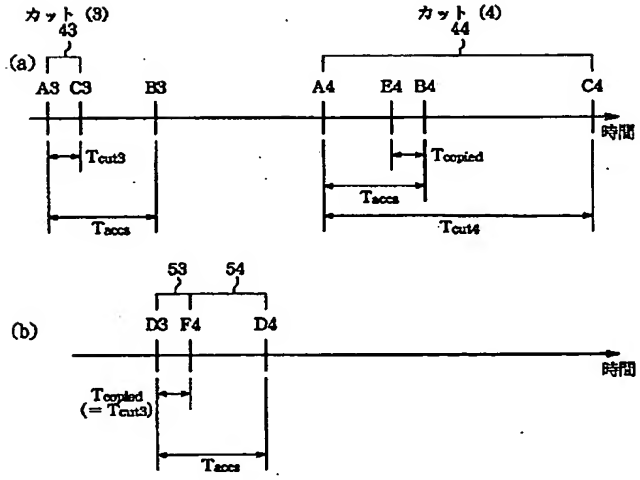
【図３】



【図７】



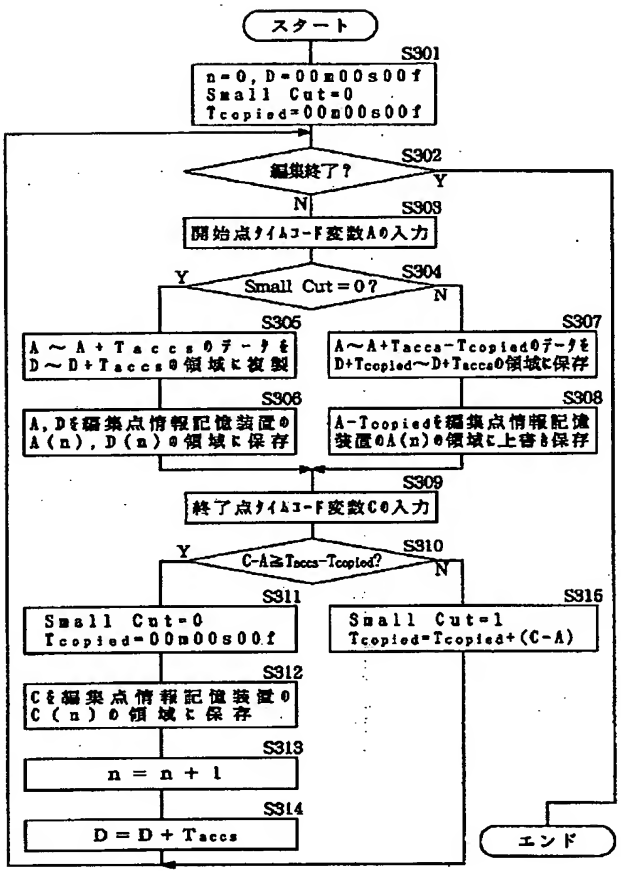
【図８】



【図１２】

n	A (n)	C (n)	D (n)
1	01m00s00f	01m10s00f	00m00s00f
2	02m00s00f	02m30s00f	00m01s00f
3	19m59s20f	20m10s00f	00m02s00f
4			

【図９】


スタート
S301
n=0, D=00m00s00f
Small Cut=0
Tcopied=00m00s00f
S302
編集終了?
Y
N
S303
開始点タイムコード変数Aの入力
S304
Small Cut=0?
Y
N
S305
A～A+Taccsのデータを
D～D+Taccsの領域に複製
S307
A～A+Tacca-Tcopiedのデータを
D+Tcopied～D+Taccaの領域に保存
S306
A, Dを編集点情報記憶装置の
A(n), D(n)の領域に保存
S308
A-Tcopiedを編集点情報記憶
装置のA(n)の領域に上書き保存
S309
終了点タイムコード変数Cの入力
S310
C-A≧Taccs-Tcopied?
Y
N
S311
Small Cut=0
Tcopied=00m00s00f
S316
Small Cut=1
Tcopied=Tcopied+(C-A)
S312
Cを編集点情報記憶装置の
C(n)の領域に保存
S313
n = n + 1
S314
D = D + Taccs
エンド